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R E P O R T

of the

MINUTES OF THE MEETING OF THE NORTH CENTRAL CORN BREEDING RESEARCH COMMITTEE

Chicago, Illinois
March 4-5, 1964

Reported by
G. F. Sprague, Secretary

Crops Research Division
Agricultural Research Service
United States Department of Agriculture
CR- 33-64 March 1964

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NORTH CENTRAL CORN BREEDING RESEARCH COMMITTEE

MORNING SESSION, March 4

The North Central Corn Breeding Research Committee was called to order by Chairman E. J. Dollinger at 9:00 a. m. A nominating committee was appointed consisting of L. H. Penny, Cahirman, E. C. Rossman and P. J. Crane. No special topics having been proposed by the Administrative Advisor, Director N. J. Volk, for the committee's consideration attention was directed to reports from the several standing sub-committees.

Dr. W. A. Russell proposed that the 1965 meeting of the North Central Corn Breeding Research Committee be held at Ames, Iowa during the proposed Plant Breeding Symposium. After some general discussion Dr.Russell MOVED "That the North Central Corn Breeding Research Committee hold its 1965 meeting at Ames, Iowa in evening sessions on March 1 and 2."

The motion was SECONDED by W. R. Findley. Voting was by States and the motion passed unanimously.

REPORT OF THE SUBCOMMITTEE ON STALK ROT

This committee proposed a cooperative study in 1961. Data have been obtained over a three-year period. Data from 66 tests conducted in 1961 and from 22 tests conducted in 1962 were summarized in previous reports. Data from 21 tests conducted in 1963 are summarized in the following tables.

Workers Submitting Data and Comments Regarding the Tests

Illinois (Urbana). A. L. Hooker. Season generally favorable for corn growth. Inoculation with Diplodia.

Michigan (East Lansing). E.C. Rossman. Tests abandoned because of unfavorable season.

Minnesota (Rosemount). Thor Kommedahl. Poor stands obtained, abundant corn borer feeding in stalk. Inoculations with Diplodia and Gibberella in alternate plots. Planting scheme systematic rather than randomized.

Missouri (Columbia). O.H. Calvert and M. S. Zuber. Below normal rainfall, several periods of severe stress due to lack of rainfall and above average temperatures. Inoculation with single isolate of Diplodia.

Ohio (Wooster). E. J. Dollinger and W. R.Findley. Season extremely dry. Inoculation with Diplodia.

Wisconsin (Madison). P.E.Hoppe. Inoculation with Diplodia; cortical ratings taken as in 1962.

The special study assigned to this sub-committee is completed with the presentation of this report.

A. L. Hooker, Chairman
P. E. Hoppe
M. S. Zuber

Table 1. Performance of 200-300 maturity inbreds in cooperative stalk lodging and stalk rot tests, 1963.

Strain	Yield Tests % lodging M. Wis.	Disease Tests Stalk rot M. Wis.
W37A	18.3	6.9
W357	8.6	4.6
A90	13.1	4.7
CH9	0.0	0.6
W153R	0.0	0.4
W33	70.1	5.8
W79A	24.0	3.4
A498	94.7	4.7
Strain MS (7 df)	3641.94**	16.28**
Error MS (14 df)	98.91	0.76
No. in range		
2	17.40	1.53
3-5	19.12	1.68
6-8	19.58	1.72

Table 2. Performance of 200-300 maturity hybrids in cooperative stalk lodging and stalk rot tests, 1963.

	Yield Tests	Disease Tests
	% lodging	S. Rot (rating)
Strain	M. Wis.	M. Wis.
W37A x W357	6.2	4.9
x A90	25.0	3.6
x CH9	2.2	3.2
x W153R	8.7	1.7
x W33	55.7	5.2
x W79A	68.2	5.9
x A498	64.3	3.6
W357 x A90	8.3	1.8
x CH9	0.0	1.9
x W153R	37.9	1.6
x W33	41.6	3.8
x W79A	73.5	3.5
x A498	64.0	2.7
A90 x CH9	0.0	2.4
x W153R	14.3	1.5
x W33	52.1	3.7
x W79A	87.2	3.5
x A498	37.2	2.5
CH9 x W153R	0.0	1.4
x W33	3.7	2.8
x W79A	24.1	3.8
x A498	8.4	2.7
W153R x W33	59.3	2.4
x W79A	41.7	2.1
x A498	14.6	1.7
W33 x W79A	65.4	6.0
x A498	85.4	5.3
W79A x A498	73.5	4.2
Strain MS (27 df)	2258.51**	5.23**
Error MS (54 df)	206.52	0.53
No. in range		
2	23.73	1.20
3-5	26.30	1.33
6-10	27.79	1.40
11-20	28.79	1.45
> 20	28.79	1.45

Table 3. Summary of performance of 500-600 maturity inbreds in cooperative stalk rot tests, 1963.

Strain	Disease Tests: Mid-silk da. (1)	Disease Tests: Stalk rot rating (2)
W22	75	2.4
Wf9	72	2.8
B8	67	3.8
Oh43E	73	3.4
MS129	76	2.8
W187R	81	3.5
W23	70	4.0
L289	71	4.3
Oh28	79	2.5
Strain df	-	8
Strain MS	-	2.34**
Strain x Loc. df	-	32
Strain x Loc. MS	-	0.83**
Error df	-	80
Error MS	-	0.12

(1) Ill.

(2) Ill., Minn. (Diplodia), Minn. (Gibberella), Mo., Wis.

Table 4. Summary of performance of 500-600 maturity single crosses in cooperative stalk lodging and stalk rot tests, 1963

Strain	Yield Tests				Disease Tests	
	Mid-silk da. (1)	S. rot % (2)	S. lodge % (3)	Acre Yield da. (4)	Mid-silk da. (5)	S. rot rating (6)
W22 x Wf9	84	52.8	11.0	92.0	76	1.6
x B8	79	44.9	10.2	84.8	73	2.0
x Oh43E	83	46.0	5.6	76.4	76	2.4
x MS129	87	42.2	5.9	81.2	78	1.9
x W187R	86	67.6	15.6	72.0	78	2.5
x W23	85	39.0	8.7	83.6	76	2.4
x L289	85	66.4	32.5	81.5	76	2.3
x Oh28	88	32.2	3.3	90.8	81	2.2
Wf9 x B8	80	50.2	14.1	90.0	72	2.1
x Oh43E	85	19.4	5.2	109.0	76	2.5
x MS129	88	39.2	14.8	95.1	77	2.3
x W187R	87	76.0	27.4	80.0	78	2.7
x W23	82	61.8	18.5	101.6	75	2.5
x L289	85	39.1	17.4	90.2	76	1.9
x Oh28	88	82.9	16.4	84.0	77	2.2
B8 x Oh43E	78	33.7	10.6	80.4	70	3.4
x MS129	80	21.0	12.1	86.2	73	3.1
x W187R	82	69.3	35.3	75.0	74	3.3
x W23	78	47.7	34.8	84.8	71	3.6
x L289	80	41.2	34.4	75.5	72	3.1
x Oh28	83	40.9	22.3	78.5	74	3.5
Oh43E x MS129	87	12.5	4.3	92.8	78	2.3
x W187R	86	53.3	18.3	93.3	77	2.8
x W23	82	44.2	29.2	84.5	73	3.4
x L289	85	56.3	12.2	88.5	76	2.2
x Oh28	89	29.2	7.2	97.0	79	2.8
MS129 x W187R	90	56.5	14.2	87.8	81	3.3
x W23	82	27.7	16.4	94.1	74	3.1
x L289	89	21.8	11.1	88.0	78	2.4
x Oh28	91	27.1	5.9	94.8	81	3.1
W187R x W23	81	89.5	58.2	85.6	74	3.3
x L289	86	75.5	55.3	88.5	77	3.0
x Oh28	90	70.2	17.7	86.4	81	2.8
W23 x L289	83	46.7	31.4	89.9	74	3.7
x Oh28	86	60.0	33.4	95.1	77	3.5
L289 x Oh28	88	47.6	16.8	81.6	79	2.4
Strain df	-	35	35	-	-	35
Strain MS	-	639.19**	533.77**	-	-	1.57**
Strain x Loc. df	-	35	70	-	-	140
Strain x Loc. MS	-	496.91**	127.13**	-	-	0.60**
Error df	-	140	210	-	-	350
Error MS	-	82.66	76.06	-	-	0.10

(1) Ohio; (2) Ill., Mo.; (3) Ill., Mo., Wis.; (4) Ohio, Mo.; (5) Ill., Ohio; (6) Ill., Minn. (Diplodia), Minn. (Gibberella), Mo., Wis.

Table 5. Performance of 500-600 maturity inbreds in cooperative stalk lodging and stalk rot tests, 1963.

	Disease Tests							
	Mid-silk (da.)		Stalk rot (ratings)					
Strain	Ill.	Ohio	Ill.	Ohio	Minn.[a]	Minn.[b]	Mo.	Wis.
W22	75	90	0.9	3.0	2.3	1.8	6.0	0.7
Wf9	72	88	1.4	3.2	3.5	2.3	5.3	1.4
B8	67	77	2.5	4.1	3.7	3.6	6.0	3.1
Oh43E	73	89	2.6	3.8	3.9	3.9	5.7	1.1
MS129	76	94	3.4	3.7	3.7	2.0	4.3	0.3
W187R	81	91	1.7	3.2	4.0	3.5	6.0	2.0
W23	70	86	4.5	4.0	3.1	2.0	6.0	4.1
L289	71	90	4.0	4.3	3.7	2.9	6.0	4.8
Oh28	79	91	3.1	3.9	1.6	1.7	5.0	1.1
Strain MS (8 df)	-	-	4.31*	0.66**	2.00**	2.13**	1.06**	7.53**
Error MS (16 df)	-	-	1.40	0.02	0.05	0.07	0.09	0.17
No. in range								
2	-	-	2.05	0.28	0.39	0.46	0.53	0.71
3-5	-	-	2.25	0.31	0.43	0.50	0.58	0.78
6-9	-	-	2.33	0.32	0.44	0.52	0.60	0.81

a Diplodia

b Gibberella

Table 6a. Performance of 500-600 maturity hybrids in cooperative stalk lodging and yield tests, 1963. Data continued in Table 6b.

	Yield Tests								
	Mid-silk (da)	Stalk rot (%)		Lodging (%)				Acre yield (bu)	
Strain	Ohio	Ill.	Mo.	Ill.	Ohio	Mo.	Wis.	Mo.	Ohio
W22 x Wf9	84	20.3	85.3	1.8	14.5	6.8	24.4	98.8	85.3
x B8	79	9.0	80.8	8.2	39.5	18.1	4.2	80.8	88.8
x Oh43E	83	60.8	31.2	1.7	16.3	10.0	5.1	94.3	58.5
x MS129	87	18.9	65.6	6.7	11.4	8.9	2.2	89.4	73.1
x W187R	86	46.3	88.9	6.7	27.2	30.0	10.1	86.1	57.9
x W23	85	15.8	62.2	14.9	53.5	11.1	0.0	95.8	71.5
x L289	85	56.2	76.7	39.4	50.4	24.3	33.8	96.3	66.7
x Oh28	88	16.9	47.6	1.9	7.9	7.9	0.0	91.7	89.8
Wf9 x B8	80	11.6	88.9	17.6	26.7	12.2	12.6	87.4	92.7
x Oh43E	85	22.4	16.4	0.9	27.3	2.2	12.6	109.6	108.4
x MS129	88	4.3	74.2	5.2	18.6	7.8	31.5	91.0	99.2
x W187R	87	54.4	97.7	25.6	64.4	18.8	37.8	79.7	80.4
x W23	82	25.8	97.8	6.7	51.2	12.6	36.2	86.2	117.0
x L289	85	29.7	48.5	13.2	25.0	12.5	26.5	106.5	74.0
x Oh28	88	16.4	49.3	2.8	29.2	12.3	34.1	101.2	66.8
B8 x Oh43E	78	24.1	43.3	6.2	57.8	25.5	0.0	84.6	76.2
x MS129	80	7.4	34.5	6.6	34.9	27.4	2.4	77.3	95.0
x W187R	82	45.3	93.3	47.4	55.6	52.2	6.2	82.3	67.6
x W23	78	19.9	75.5	35.0	36.5	42.2	27.1	78.1	91.4
x L289	80	37.9	44.4	41.0	78.5	40.0	22.2	85.0	66.0
x Oh28	83	19.6	62.2	12.1	59.3	25.5	29.4	82.0	75.0
Oh43E x MS129	87	13.8	11.1	2.6	8.2	7.9	2.4	96.4	89.1
x W187R	86	60.5	46.2	13.5	57.4	20.6	20.8	111.8	74.8
x W23	82	59.0	29.3	23.7	63.5	10.6	53.3	96.1	72.8
x L289	85	74.3	38.3	9.4	57.7	18.3	8.9	96.5	80.6
x Oh28	89	36.2	22.3	0.9	18.4	16.7	4.0	100.5	93.5
MS129 x W187R	90	44.2	68.9	20.7	39.3	15.6	6.2	101.7	73.8
x W23	82	0.9	54.4	5.4	30.7	10.0	33.8	98.6	89.6
x L289	89	16.9	26.7	15.3	42.1	15.6	2.2	99.3	76.8
x Oh28	91	8.6	45.7	3.4	14.4	14.4	0.0	95.2	94.5
W187R x W23	81	79.0	100.0	57.2	66.9	42.2	75.4	89.3	81.8
x L289	86	89.8	61.1	65.5	64.3	42.2	58.2	97.0	80.0
x Oh28	90	58.6	81.8	14.7	16.8	20.2	18.1	88.9	84.0

Table 6a Continued

W23 x L289	83	52.2	41.1	41.7	78.9	13.3	39.3	101.1	78.7
x Oh28	86	54.6	65.5	30.6	69.8	21.1	48.4	100.4	89.8
L289 x Oh28	88	40.7	54.5	12.9	39.3	15.2	22.4	105.6	57.7
Strain MS (35df)	-	1,606.52**	1,801.80**	862.10**	1,330.97**	423.77**	1,078.24**	-	-
Error MS (70df)	-	246.19	249.75	137.12	297.51	103.34	444.12	-	-
No. in range									
2	-	25.64	25.82	19.13	28.18	16.61	34.43	-	-
3-5	-	28.44	28.64	21.23	31.27	18.43	38.20	-	-
6-10	-	30.17	30.38	22.51	33.16	19.54	40.52	-	-
11-20	-	31.43	31.66	23.46	34.56	20.37	42.22	-	-
$\geq$ 20	-	31.52	31.75	23.53	34.65	20.42	42.34	-	-

Table 6b. Data continued from Table 6a. Performance of 500-600 maturity hybrids in cooperative stalk rot tests, 1963.

	Mid-silk (da)	Disease tests					
		S. rot (rating)					
Strain	Ill.	Ill.	Minn.[a]	Minn.[b]	Mo.	Ohio	Wis.
W22 x Wf9	68	1.3	1.5	1.3	3.3	3.9	0.7
x B8	67	0.9	1.3	1.1	5.0	3.8	1.9
x Oh43E	68	1.6	2.4	1.8	5.7	3.9	0.3
x MS129	68	1.7	1.6	1.2	4.3	3.8	0.5
x W187R	70	0.7	2.4	2.2	6.0	3.6	1.1
x W23	68	2.0	1.7	1.7	5.0	4.3	1.4
x L289	67	0.9	2.0	2.0	5.3	3.6	1.2
x Oh28	73	1.9	2.7	1.3	4.7	3.5	0.7
Wf9 x B8	65	0.9	1.9	1.7	4.3	4.2	1.5
x Oh43E	66	1.1	3.0	3.5	4.7	3.8	0.4
x MS129	67	2.5	2.0	1.4	4.7	3.5	0.7
x W187R	68	1.1	3.5	2.6	5.7	3.8	0.5
x W23	67	2.1	2.0	1.5	4.7	4.0	1.9
x L289	67	1.0	2.0	2.2	3.7	3.7	0.7
x Oh28	68	1.3	2.9	1.4	4.7	3.5	0.6
B8 x Oh43E	63	1.7	4.0	3.0	5.7	4.2	2.4
x MS129	66	2.9	2.2	1.2	6.0	4.1	3.2
x W187R	66	1.4	4.0	2.8	6.0	4.5	2.1
x W23	65	3.3	2.6	1.5	6.0	4.5	4.6
x L289	65	1.5	3.7	2.4	5.7	4.4	2.3
x Oh28	66	2.8	3.5	2.0	5.3	3.9	4.0
Oh43E x MS129	69	2.6	2.4	1.8	4.7	3.9	0,2
x W187R	69	1.1	3.5	2.3	5.7	3.5	1.6
x W23	64	3.3	3.0	1.0	6.0	4.4	3.6
x L289	66	1.1	2.9	1.0	5.3	3.8	0.4
x Oh28	70	2.4	3.8	2.0	5.3	3.6	0.5
MS129 x W187R	72	2.9	3.5	3.2	6.0	3.4	0.9
x W23	67	3.4	3.7	2.6	4.0	4.0	1.6
x L289	68	1.2	3.3	2.8	4.3	3.7	0.5
x Oh28	71	3.4	3.9	2.7	5.0	3.9	0.8
W187R x W23	67	2.9	3.1	1.4	5.3	4.2	3.7
x L289	68	1.0	3.6	1.7	5.0	3.8	3.6
x Oh28	72	1.4	3.7	1.9	5.0	3.2	1.9

Table 6b Continued

W23 x L289	67	2.8	4.0	3.2	5.0	3.9	3.7
x Oh28	68	2.8	3.8	1.8	6.0	4.1	3.2
L289 x Oh28	69	1.2	2.1	2.3	5.3	3.6	1.2
Strain MS (35df)	-	2.23**	2.07**	1.35**	1.45**	0.31**	4.78**
Error MS (70df)	-	0.22	0.11	0.14	0.25	0.09	0.85
No. in range							
2	-	0.77	0.54	0.60	0.82	0.50	1.51
3-5	-	0.85	0.60	0.67	0.91	0.56	1.67
6-10	-	0.90	0.64	0.71	0.96	0.59	1.77
11-20	-	0.94	0.66	0.74	1.00	0.62	1.85
> 20	-	0.94	0.67	0.74	1.00	0.62	1.85

a Diplodia
b Gibberella

Table 7. Relative performance of inbred lines as lines and in hybrid combination (average of all hybrids in set of diallel crosses containing the inbred), 1963.

CHARACTER AND STRAIN	INBRED LINES								
2-300 maturity	W37A	W357	A90	CH9	W153R	W33	W79A	A498	
% S. lodging - As inbreds (1)	18.3	8.6	13.1	0.0	0.0	70.1	24.0	94.7	
- In hybrids (2)	32.9	33.1	32.0	5.5	25.2	51.9	61.9	49.6	
S. rot rating - As inbreds (3)	6.9	4.6	4.7	0.6	0.4	5.8	3.4	4.7	
- In hybrids (4)	3.9	2.8	2.7	2.6	1.8	4.2	4.2	3.2	
5-600 maturity	W22	Wf9	B8	Oh43E	MS129	W187R	W23	L289	Oh28
% S. lodging - As inbreds (5)	0.0	11.3	3.9	0.0	6.7	37.3	82.0	90.3	27.5
- In hybrids (6)	15.6	20.2	28.2	17.9	13.9	35.5	35.7	33.4	18.7
S. rot rating - As inbreds (7)	2.6	2.9	3.8	3.5	2.9	3.4	4.0	4.3	3.0
- In hybrids (8)	2.4	2.5	3.2	2.9	2.9	3.1	3.3	2.8	3.0

(1), (2), (3), (4), and (5) Wis.

(6) Ill., Mo., Ohio, Wis.

(7), (8) Ill., Minn. (both Diplodia and Gibberella), Mo., Ohio, Wis.

Table 8. Performance of 500-600 maturity inbreds in hybrid combination (average of all crosses containing the inbred in a set of diallel crosses), 1963.

		INBRED								
Character	Location	W22	Wf9	B8	Oh43E	MS129	W187R	W23	L289	Oh28
% Lodging	Ill.	10.2	11.2	21.8	7.4	8.2	33.7	26.9	29.8	10.1
% Lodging	Mo.	14.6	10.6	29.6	12.7	12.2	30.2	20.4	22.7	13.3
% Lodging	Ohio	27.6	32.1	48.6	38.3	24.9	49.0	56.4	54.5	31.9
% Lodging	Wis.	9.9	26.9	13.0	13.4	10.1	29.1	39.2	26.7	19.5
S. Rot rating	Ill.[a]	1.4	1.4	1.9	1.9	2.6	1.5	2.8	1.3	2.2
S. Rot rating	Minn.[a]	1.9	2.3	2.9	3.1	2.8	3.4	3.0	3.0	3.3
S. Rot rating	Minn.[b]	1.6	1.9	1.9	2.1	2.1	2.3	1.9	2.2	1.9
S. Rot rating	Mo.[a]	4.9	4.5	5.5	5.4	4.9	5.6	5.3	4.9	5.2
S. Rot rating	Ohio[a]	3.8	3.8	4.2	3.9	3.8	3.7	4.2	3.8	3.7
S. Rot rating	Wis.[a]	1.0	0.9	2.8	1.2	1.1	1.9	3.0	1.8	1.6

a Diplodia

b Gibberella

Table 9. Correlation coefficients measuring the similarity of varietal reaction in various paired comparisons of 200-300 maturity inbreds.

(6 df, minimum r 5% .71 1% .83)

	1	2	3	4	5	6	7	8	9	10
1		.48	.50	.55	.51	-.23	.11	.66	.50	.68
2	.48		.82	.68	.93	-.57	.17	.80	.85	.91
3	.50	.82		.59	.89	-.15	.19	.67	.68	.87
4	.55	.68	.59		.77	-.61	.76	.96	.86	.84
5	.51	.93	.89	.77		-.58	.28	.86	.82	.95
6	-.23	-.57	-.15	-.61	-.58		-.27	-.67	-.57	-.50
7	.11	.17	.19	.76	.28	-.27		.53	.49	.37
8	.66	.80	.67	.96	.86	-.67	.53		.89	.92
9	.50	.85	.68	.86	.82	-.57	.49	.89		.92
10	.68	.91	.87	.84	.95	-.50	.37	.92	.92	

1	1963	S. Rot score	M. Wis.
2	"	% lodging	"
3	1961	"	Mich., N.D.
4	"	S. Rot score	Mich., M. Wis.
5	"	% lodging	Mich.
6	"	"	N.D.
7	"	S. Rot score	Mich.
8	"	"	M. Wis.
9	1962	% lodging	"
10	"	S. Rot score	"

Table 10. Correlation coefficients measuring the similarity of varietal reaction in various paired comparisons of 200-300 maturity hybrids.

(26 df, minimum r 5% .37 1% .48)

	1	2	3	4	5	6	7	8	9	10	11	12	13
1		.62	-.18	-.44	.72	.21	-.25	-.36	-.27	.50	.74	.58	.80
2	.62		-.18	-.67	.72	.35	-.30	-.69	-.14	.46	.74	.80	.71
3	-.18	-.18		.17	-.04	.16	.95	.17	.04	.14	-.12	-.28	-.10
4	-.44	-.67	.17		-.55	-.11	.21	.90	.46	-.26	-.63	-.65	-.56
5	.72	.72	-.04	-.55		.54	-.22	-.49	-.27	.81	.96	.65	.74
6	.21	.35	.16	-.11	.54		-.16	-.17	.09	.51	.49	.35	.47
7	-.25	-.30	.95	.21	-.22	-.16		.23	.01	-.02	-.28	-.39	-.26
8	-.36	-.69	.17	.90	-.49	-.17	.23		.02	-.20	-.56	-.71	-.54
9	-.27	-.14	.04	.46	-.27	.09	.01	.02		-.18	-.29	-.05	-.17
10	.50	.46	.14	-.26	.81	.51	-.02	-.20	-.18		.63	.36	.46
11	.74	.74	-.12	-.63	.96	.49	-.28	-.56	-.29	.63		.70	.78
12	.58	.80	-.28	-.65	.65	.35	-.39	-.71	-.05	.36	.70		.74
13	.80	.71	-.10	-.56	.74	.47	-.26	-.54	-.17	.46	.78	.74	

1	1963	S. Rot score	M. Wis.
2	"	% lodging	"
3	1961	"	Mich., N.D.
4	"	Yield (bu/acre)	" "
5	"	S. Rot score	Mich., M. Wis.
6	"	% lodging	Mich.
7	"	"	N.D.
8	"	Yield (bu/acre)	Mich.
9	"	"	N.D.
10	1961	S. Rot score	Mich.
11	"	"	M. Wis.
12	1962	% lodging	"
13	"	S. Rot score	"

Table 11. Correlation coefficients measuring the similarity of varietal reaction in various paired comparisons of 500-600 inbreds.

(7 df, minimum r 5% .67 1% .80)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1		.47	.51	.23	-.24	-.06	-.54	.31	.31	.37	.51	-.08	-.05	.04
2	.47		.41	.63	.26	.26	-.57	.84	.50	.64	.45	-.04	-.10	.32
3	.51	.41		-.26	-.25	-.26	-.09	.60	.87	.68	.76	.68	.37	.77
4	.23	.63	-.26		.16	.45	-.35	.36	-.21	.28	-.36	-.64	-.58	-.18
5	-.24	.26	-.25	.16		.74	-.32	.05	.18	.06	-.11	.10	.48	-.05
6	-.06	.26	-.26	.45	.74		-.26	-.09	.14	.27	-.38	.02	.16	-.18
7	-.54	-.57	-.09	-.35	-.32	-.26		-.14	-.24	.01	-.42	.08	-.23	-.03
8	.31	.84	.60	.36	.05	-.09	-.14		.53	.66	.48	.11	-.05	.51
9	.31	.50	.87	-.21	.18	.14	-.24	.53		.72	.71	.83	.57	.76
10	.37	.64	.68	.28	.06	.27	.01	.66	.72		.35	.37	-.04	.55
11	.51	.45	.76	-.36	-.11	-.38	-.42	.48	.71	.35		.51	.38	.49
12	-.08	-.04	.68	-.64	.10	.02	.08	.11	.83	.37	.51		.74	.67
13	-.05	-.10	.37	-.58	.48	.16	-.23	-.05	.57	-.04	.38	.74		.44
14	.04	.32	.77	-.18	-.05	-.18	-.03	.51	.76	.55	.49	.67	.44	
15	.34	.58	.68	-.02	.35	.42	-.42	.46	.91	.63	.57	.70	.54	.49
16	.50	.74	.70	.41	-.11	.22	-.17	.70	.69	.93	.38	.29	-.13	.52
17	.68	.90	.40	.60	.00	-.03	-.66	.73	.31	.45	.50	-.24	-.20	.25
18	.44	.93	.65	.44	.12	.12	-.46	.85	.70	.77	.56	.21	.02	.64
19	.54	.68	.70	.18	.15	.24	-.45	.60	.86	.77	.55	.52	.39	.75
20	.32	.92	.38	.54	.06	-.05	-.43	.86	.38	.54	.49	-.11	-.25	.37
21	.37	.75	.38	.66	-.16	.18	-.12	.65	.35	.82	.15	-.10	-.52	.29
22	-.43	-.57	-.02	-.63	.05	-.30	.10	-.37	-.03	-.56	-.02	.37	.66	.31
23	-.08	.27	.40	-.30	-.09	-.48	.29	.61	.31	.28	.56	.23	-.01	.25
24	-.38	.13	-.02	.32	.47	.50	.22	.22	.14	.31	-.48	.11	.20	.40
25	.63	.74	.25	.43	.28	.26	-.91	34	.39	.33	.53	-.05	.08	.15
26	.33	.74	.65	.36	-.03	-.09	.01	.91	.60	.79	.33	.23	-.08	.47
27	.18	.63	.59	.40	-.08	-.02	-.08	.73	.53	.74	.24	.20	-.06	.80

Table 11a. Continuation from Table 11. Correlation coefficients measuring the similarity of varietal reaction in various paired comparisons of 500-600 inbreds.

(7 df, minimum _r_ 5% .67 1% .80)

	15	16	17	18	19	20	21	22	23	24	25	26	27
1	.34	.50	.68	.44	.54	.32	.37	-.43	-.08	-.38	.63	.33	.18
2	.58	.74	.90	.93	.68	.92	.75	-.57	.27	.13	.74	.74	.63
3	.68	.70	.40	.65	.80	.38	.38	-.02	.40	-.02	.25	.75	.59
4	-.02	.41	.60	.44	.18	.54	.66	-.63	-.30	.32	.43	.36	.40
5	.35	-.11	.00	.12	.15	.06	-.16	.05	-.09	.47	.28	-.03	-.08
6	.42	.22	-.03	.12	.24	-.05	.18	-.30	-.48	.50	.26	-.09	-.02
7	-.42	-.17	-.66	-.46	-.45	-.43	-.12	.10	.29	.22	-.91	.01	-.08
8	.46	.70	.73	.85	.60	.86	.65	-.37	.61	.22	.34	.91	.73
9	.91	.69	.31	.70	.86	.38	.35	-.03	.31	.14	.39	.60	.53
10	.63	.93	.45	.77	.77	.54	.82	-.56	.28	.31	.33	.79	.74
11	.57	.38	.50	.56	.55	.49	.15	-.02	.56	-.48	.53	.33	.24
12	.70	.29	-.24	.21	.52	-.11	-.10	.37	.23	.11	-.05	.23	.20
13	.54	-.13	-.20	.02	.39	-.25	-.52	.66	-.01	.20	.08	-.08	-.06
14	.49	.52	.25	.64	.75	.37	.29	.31	.25	.40	.15	.47	.80
15		.67	.33	.64	.80	.36	.34	-.17	.13	.11	.49	.59	.35
16	.67		.61	.84	.81	.63	.89	-.60	.17	.19	.44	.85	.75
17	.33	.61		.83	.60	.88	.65	-.49	.18	-.08	.80	.57	.58
18	.64	.84	.83		.84	.89	.77	-.41	.30	.20	.68	.77	.83
19	.80	.81	.60	.84		.51	.54	-.14	.01	.30	.60	.64	.74
20	.36	.63	.88	.89	.51		.73	-.50	.48	.02	.64	.67	.67
21	.34	.89	.65	.77	.54	.73		-.78	.16	.15	.42	.74	.72
22	-.17	-.60	-.49	-.41	-.14	-.50	-.78		-.15	.18	-.37	-.48	-.17
23	.13	.17	.18	.30	.01	.48	.16	-.15		-.22	-.10	.46	.17
24	.11	.19	-.08	.20	.30	.02	.15	.18	-.22		-.21	.29	.51
25	.49	.44	.80	.68	.60	.64	.42	-.37	-.10	-.21		.19	.30
26	.59	.85	.57	.77	.64	.67	.74	-.48	.46	.29	.19		.69
27	.35	.75	.58	.83	.74	.67	.72	-.17	.17	.51	.30	.69	

Table 11 and 11a continued.

1	1963	S. Rot score	Ohio
2	"	"	Wis.
3	"	"	Ill.
4	"	"	Mo.
5	"	"	Minn. (Diplodia)
6	"	"	Minn. (Gibberella)
7	"	Mid-silk	Ill.
8	"	% lodging	Wis.
9	1961	S. Rot score	Ill., Ind., Mich., Minn. (D), Minn. (G), Ohio
10	"	"	Ind.
11	"	"	Mich.
12	"	"	Minn. (Diplodia)
13	"	"	Minn. (Gibberella)
14	"	"	Ohio
15	"	"	Ill.
16	"	% S. Rot	Ind.
17	"	% lodging	Mich.
18	1962	S. Rot score	Ill. (Pith rating), Ill. (cortical rating), Ind., Minn. (Diplodia), Minn. (Gibberella), Mo., Ohio, Wis. (Madison, cortical rating)
19	"	"	Ill. (Pith)
20	"	"	Ill. (cortical)
21	"	"	Ind.
22	"	"	Minn. (Diplodia)
23	"	"	Minn. (Gibberella)
24	"	"	Mo.
25	"	"	Ohio
26	"	"	M. Wis.
27	"	% lodging	"

Table 12a. Correlation coefficients measuring the similarity of varietal reaction in various paired combinations of 500-600 hybrids.

(34 df, minimum r 5% .34 1% .43)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1		.57	.35	.25	.05	-.07	.16	.35	.43	.45	-.08	.07	-.57	-.42	.07	.32	-.59	.43	.16	.27	.50
2	.57		.42	.43	.29	-.11	.54	.59	.62	.63	.24	.20	-.53	-.39	.03	.67	-.77	.65	.29	.63	.55
3	.35	.42		.20	.28	-.03	.19	-.01	-.09	.04	-.21	-.18	.07	-.10	.32	.20	-.44	.73	-.19	.17	.28
4	.25	.43	.20		.39	.10	.04	.35	.53	.48	.44	.02	-.09	-.32	-.29	.38	-.25	.24	.37	.35	.33
5	.05	.29	.28	.39		.59	.16	.34	.28	.42	.35	-.22	.07	.11	-.05	.37	-.14	.32	.11	.44	.00
6	-.07	-.11	-.03	.10	.59		-.16	.12	.01	.19	.01	-.18	-.02	.30	-.10	.12	.17	-.08	.01	.17	-.18
7	.16	.54	.19	.04	.16	-.16		.62	.30	.52	.50	.33	-.19	.08	.03	.50	-.37	.39	.34	.46	.29
8	.35	.59	-.01	.35	.34	.12	.62		.75	.70	.63	.38	-.23	-.18	-.23	.81	-.32	.23	.60	.78	.35
9	.43	.62	-.09	.53	.28	.01	.30	.75		.54	.44	.40	-.37	-.47	-.29	.65	-.40	.14	.55	.62	.36
10	.45	.63	.04	.48	.42	.19	.52	.70	.54		.53	.15	-.47	-.10	-.20	.66	-.42	.36	.46	.63	.29
11	-.08	.24	-.21	.44	.35	.01	.50	.63	.44	.53		.13	.01	.18	-.38	.42	.07	-.10	.47	.45	.02
12	.07	.20	-.18	.02	-.22	-.18	.33	.38	.40	.15	.13		.03	-.47	.01	.19	-.18	.00	.47	.12	.06
13	-.57	-.53	.07	-.09	.07	-.02	-.19	-.23	-.37	-.47	.01	.03		.23	-.08	-.23	.44	-.08	.01	-.15	-.43
14	-.42	-.39	-.10	-.32	.11	.30	.08	-.18	-.47	-.10	.18	-.47	.23		-.09	-.14	.53	-.10	-.14	-.03	-.42
15	.07	.03	.32	-.29	-.05	-.10	.03	-.23	-.29	-.20	-.38	.01	-.08	-.09		-.22	.04	.15	-.34	-.29	-.07
16	.32	.67	.20	.38	.37	.12	50	.81	.65	.66	.42	.19	-.23	-.14	-.22		-.50	.50	.59	.95	.41
17	-.59	-.77	-.44	-.25	-.14	.17	-.37	-.32	-.40	-.42	.07	-.18	.44	.53	-.04	-.50		-.66	-.10	-.47	-.57
18	.43	.65	.73	.24	.32	-.08	.39	.23	.14	.36	-.10	.00	-.08	-.10	.15	.50	-.66		.15	.50	.35
19	.16	.29	-.19	.37	.11	.01	.34	.60	.55	.46	.47	.47	.01	-.14	-.34	.59	-.10	.15		.54	.16
20	.27	.63	.17	.35	.44	.17	.46	.78	.62	.63	.45	.12	-.15	-.03	-.29	.95	-.47	.50	.54		.23
21	.50	.55	.28	.33	.00	-.18	.29	.35	.36	.29	.02	.06	-.43	-.42	-.07	.41	-.57	.36	.16	.23	
22	.24	.55	.16	.34	.30	.11	.48	.77	.60	.61	.38	.27	-.21	-.17	-.13	.95	-.40	.42	.62	.84	.36
23	-.68	-.72	-.41	-.35	-.02	.24	-.13	-.20	-.40	-.36	.14	-.16	.47	.62	.00	-.35	.88	-.59	-.06	-.32	-.54
24	.43	.00	-.18	.13	-.23	-.05	-.35	-.06	.13	.09	-.23	.13	-.33	-.33	.04	-.20	.15	-.16	.09	-.27	.12
25	-.74	-.65	-.20	-.16	-.06	.07	-.26	-.35	-.42	-.48	.19	-.27	.62	.58	-.11	-.39	.77	-.44	-.21	-.29	-.58
26	.36	.66	.33	.40	.27	-.04	.46	.61	.61	.47	.17	.42	-.06	-.35	-.23	.72	-.62	.69	.47	.72	.32
27	.12	.30	.70	-.12	.11	-.07	.14	-.06	-.18	-.05	-.34	.06	.20	-.02	.35	.23	-.42	.74	-.10	.23	.10
28	.27	.49	.39	.29	.29	-.03	.32	.08	.14	.31	.06	.01	-.12	-.04	.12	.23	-.43	.69	.19	.22	.28
29	.15	.36	.57	.10	.30	.03	.20	.23	.01	.25	-.16	-.19	.03	.02	.32	.44	-.33	.70	.08	.43	.13
30	.23	-.06	.41	-.04	.07	.04	.01	-.29	-.51	-.05	-.14	-.58	.01	.43	.16	-.18	-.01	.32	-.27	-.13	.08
31	.51	.66	.70	.25	.27	-.14	.32	.14	.07	.39	-.12	-.07	-.21	-.14	.15	.40	-.66	.90	.06	.37	.41
32	-.07	.44	.28	.16	.26	-.16	.69	.41	.22	.33	.41	.26	.12	.06	.11	.47	-.34	.47	.27	.51	-.08
33	.41	.78	.32	.27	.31	.03	.58	.75	.62	.58	.23	.39	-.25	-.35	-.01	.78	-.66	.60	.40	.73	.45
34	.37	.38	.66	.27	.45	.10	.28	.36	.31	.26	.11	-.10	-.01	-.11	.15	.52	-.36	.60	.14	.52	.20
35	.14	.37	-.01	.10	.01	.00	.46	.67	.54	.31	.27	.67	.05	-.29	-.16	.59	-.24	.21	.58	.54	.27
36	.34	.68	-.03	.41	.16	.01	.53	.68	.60	.67	.41	.40	-.34	-.30	-.20	.62	-.52	.34	.56	.58	.38
37	.07	.07	-.03	-.42	-.27	-.11	.13	-.03	-.22	.01	-.36	.12	-.17	.08	.25	-.03	-.15	.00	-.16	-.01	.05
38	-.60	-.25	-.11	-.34	-.17	-.17	-.06	-.22	-.39	-.33	-.10	-.06	.41	.31	.00	-.11	.27	-.09	-.14	-.09	-.29
39	.46	.53	.46	.49	.26	-.04	.02	.21	.40	.24	.00	.00	-.14	-.44	.21	.18	-.43	.37	-.04	.17	.23
40	.53	.75	.17	.15	.16	-.03	.40	.46	.49	.54	.04	.14	-.65	-.34	-.14	.49	-.73	.48	.09	.46	.52
41	-.18	.29	.06	.33	.53	.25	.25	.49	.39	.26	.50	.16	.25	.00	-.15	.44	-.11	.17	.29	.43	.08

Table 12b continued.

(34 df, minimum r 5% .34 1% .43)

	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
1	.24	-.68	.43	-.74	.36	.12	.27	.15	.23	.51	-.07	.41	.37	.14	.34	.07	-.60	.46	.53	-.18
2	.55	-.72	.00	-.65	.66	.30	.49	.36	-.06	.66	.44	.78	.38	.37	.68	.07	-.25	.53	.75	.29
3	.16	-.41	-.18	-.20	.33	.70	.39	.57	.41	.70	.28	.32	.66	-.01	-.03	-.03	-.11	.45	.17	.06
4	.34	-.35	.13	-.16	.40	-.12	.29	.10	-.04	.25	.16	.27	.27	.10	.41	-.42	-.34	.49	.15	.33
5	.30	-.02	-.23	-.06	.27	.11	.29	.30	.07	.27	.26	.31	.45	.01	.16	-.27	-.17	.26	.15	.53
6	.11	.24	-.05	.07	-.04	-.07	-.03	.03	.04	-.14	-.16	.03	.10	.00	.01	-.11	-.17	-.04	-.03	.25
7	.48	-.13	-.35	-.26	.46	.14	.32	.20	.01	.32	.69	.58	.28	.46	.53	.13	-.06	.02	.40	.25
8	.77	-.20	-.06	-.35	.61	-.06	.08	.23	-.29	.14	.41	.75	.36	.67	.68	-.03	-.22	.21	.46	.49
9	.60	-.40	.13	-.42	.61	-.18	.14	.01	-.51	.07	.22	.62	.31	.54	.60	-.22	-.39	.40	.49	.39
10	.61	-.36	.09	-.48	.47	-.05	.31	.25	-.05	.39	.33	.58	.26	.31	.67	.01	-.33	.24	.54	.26
11	.38	.14	-.23	.19	.17	-.34	.06	-.16	-.14	-.12	.41	.23	.11	.27	.41	-.36	-.10	.00	.04	.50
12	.27	-.16	.13	-.27	.42	.06	.01	-.19	-.58	-.07	.26	.39	-.10	.67	.40	.12	-.06	.00	.14	.16
13	-.21	.47	-.33	.62	-.06	20	-.12	.03	.01	-.21	.12	-.25	-.01	.05	-.34	-.17	.41	-.14	-.65	.25
14	-.17	.62	-.33	.58	-.35	-.02	-.04	.02	.43	-.14	.06	-.35	-.11	-.29	-.30	.08	.31	-.44	-.34	.00
15	-.13	.00	.04	-.11	-.23	.35	.12	.32	.16	.15	.11	-.01	.15	-.16	-.20	.25	.00	.21	-.14	-.15
16	.95	-.35	-.20	-.39	.72	.23	.23	.44	-.18	.40	.47	.78	.52	.59	.62	-.03	-.11	.18	.49	.44
17	-.40	.88	.15	.77	-.62	-.42	-.43	-.33	-.01	-.66	-.34	-.66	-.36	-.24	-.52	-.15	.27	-.43	-.73	-.11
18	.42	-.59	-.16	-.44	.69	.74	.69	.70	.32	.90	.47	.60	.60	.21	.34	.00	-.09	.37	.48	.17
19	.62	- 06	.09	-.21	.47	-.10	.19	.08	-.27	.06	.27	.40	.14	.58	.56	-.16	-.14	-.04	.09	.29
20	.84	-.32	-.27	-.29	.72	.23	.22	.43	-.13	.37	.51	.73	.52	.54	.58	-.01	-.09	.17	.46	.43
21	.36	-.54	.12	-.58	.32	.10	.28	.13	.08	.41	-.08	.45	.20	.27	.38	.05	-.29	.23	.52	.08
22		-.25	-.15	-.37	.64	.21	.17	.43	-.27	.33	.45	.72	.48	.59	.56	-.07	-.05	.12	.38	.45
23	-.25		- 22	.70	- 57	-.32	-.38	-.21	-.06	-.61	-.13	-.50	-.22	-.16	-.44	.00	.41	-.57	-.69	.06
24	-.15	-.22		-.34	-.06	-.28	-.14	-.23	.04	-.04	-.55	-.14	-.31	- 04	05	-.01	-.34	.22	.04	-.31
25	-.37	.70	-.34		-.46	-.18	-.25	-.19	.02	-.51	-.01	-.57	-.16	-.24	-.54	-.31	.34	-.34	-.64	-.03
26	.64	-.57	-.06	-.46		.39	.39	.38	-.17	.50	.46	.78	.49	.66	.65	-.14	-.22	.34	.51	.37
27	.21	-.32	-.28	-.18	.39		.38	.57	.15	.58	.37	.35	.43	.17	-.08	.20	.18	.19	.15	.10
28	.17	-.38	-.14	-.25	.39	.38		.38	.10	.61	.46	.39	.36	.09	.40	-.18	-.23	.29	.41	.18
29	.43	-.21	-.23	-.19	.38	.57	.38		.16	.55	.35	.45	.58	.06	.15	.11	.12	.25	.21	.17
30	-.27	-.06	.04	.02	-.17	.15	.10	.16		.40	-.12	-.26	.10	-.43	-.24	-.01	-.12	-.03	-.09	-.31
31	.33	-.61	-.04	-.51	.50	.58	.61	.55	.40		.33	.49	.48	.04	.27	.06	-.07	.36	.50	.08
32	.45	-.13	-.55	-.01	.46	.37	.46	.35	-.12	.33		.56	.39	.41	.43	.01	.08	.12	.26	.37
33	.72	-.50	-.14	-.57	.78	.35	.39	.45	-.26	.49	.56		.51	.75	.75	.12	-.09	.37	.67	.53
34	.48	-.22	-.31	-.16	.49	.43	.36	.58	.10	.48	.39	.51		.30	.14	-.25	-.30	.28	.19	.22
35	.59	-.16	-.04	-.24	.66	.17	.09	.06	-.43	.04	.41	.75	.30		.60	-.02	-.11	.01	.32	.41
36	.56	-.44	.05	-.54	.65	-.08	.40	.15	-.24	.27	.43	.75	.14	.60		.01	-.30	.23	.58	.40
37	-.07	.00	-.01	-.31	-.14	.20	-.18	.11	-.01	.06	.01	.12	-.25	-.02	.01		.36	-.12	.09	-.21
38	-.05	.41	-.34	.34	-.22	.18	-.23	.12	-.12	-.07	.08	-.09	-.30	-.11	-.30	.36		-.25	-.27	.24
39	.12	-.57	.22	-.34	.34	.19	.29	.25	-.03	.36	.12	.37	.28	.01	.23	-.12	-.25		.20	.30
40	.38	-.69	.04	-.64	.51	.15	.41	.21	-.09	.50	.26	.67	.19	.32	.58	.09	-.27	.20		.02
41	.45	.06	-.31	-.03	.37	.10	.18	.17	-.31	.08	.37	.53	.22	.41	.40	-.21	.24	.30	.02	

Table 12a and 12b continued.

1	1963	S. Rot score	Ohio	25	1961	Yield (bu/acre)	Ohio
2	"	"	Wis.	26	"	S. Rot score	Ind.
3	"	"	Ill.	27	"	"	Mich.
4	"	"	Mo.	28	"	"	Ohio
5	"	"	Minn. (Diplodia)	29	"	"	Minn. (Diplodia)
6	"	"	Minn. (Gibberella)	30	"	"	Minn. (Gibberella)
7	"	% lodging	Wis.	31	"	"	Ill.
8	"	"	Ill.	32	1962	% lodging	M. Wis.
9	"	"	Mo.	33	"	S. Rot score	Ill. (Pith rating), Ill. (cortical rating), Ind., Minn. (Diplodia), Minn. (Gibberella), Mo., Ohio., Wis. (Madison, cortical rating)
10	"	"	Ohio				
11	"	% S. Rot	Ill.				
12	"	"	Mo.				
13	"	Mid-silk	Ill.	34	"	"	Ill. (Pith ratings)
14	"	Yield (bu/acre)	Mo.	35	"	"	Ill. (cortical ratings)
15	"	"	Ohio	36	"	"	Ind.
16	1961	% lodging	Ind., Mich., Ohio	37	"	"	Minn. (Diplodia)
17	"	Yield	Ind., Mich., Ohio	38	"	"	Minn. (Gibberella)
18	"	S. Rot score	Ill., Ind., Mich., Minn. (Diplodia), Minn. (Gibberella), Ohio	39	"	"	Mo.
				40	"	"	Ohio
19	"	% S. Rot	Ohio	41	"	"	M. Wis.
20	"	% lodging	Ind.				
21	"	"	Mich.				
22	"	"	Ohio				
23	"	Yield (bu/acre)	Ind.				
24	"	"	Mich.				

Table 13. Summary of mean squares from combined analyses of variance for stalk rot ratings and percentage lodged taken for two or more years at the same location.

Years	Location			Years df	Years MS	Corn Strain df	Corn Strain MS	Years x Strain df	Years x Strain MS	Error df	Error MS
				(stalk rot rating)							
1961, 1962, 1963	M. Wis.	2-300	Inbreds	2	19.67**	7	6.73**	14	1.24**	42	0.11
"	"	"	Hybrids	2	63.04**	26	2.51**	52	0.31**	162	0.10
"	Ill.	5-600	Inbreds	2	5.04**	8	4.26**	16	0.34	48	0.20
"	"	"	Hybrids	2	13.11*	35	1.72**	70	0.29**	210	0.08
"	Minn. (D)	"	Inbreds	2	14.65**	8	0.61**	16	0.89**	48	0.05
"	"	"	Hybrids	2	19.28**	35	0.35**	70	0.35**	210	0.08
"	Minn. (G)	"	Inbreds	2	1.22**	8	0.32**	16	0.44**	48	0.04
"	"	"	Hybrids	2	3.53**	35	0.21**	70	0.25**	210	0.05
1962, 1963	Mo.	"	Inbreds	1	1.83**	8	0.29**	8	0.16	32	0.07
"	"	"	Hybrids	1	25.09**	35	0.43**	35	0.19**	140	0.08
"	M. Wis.	"	Inbreds	1	7.30**	8	2.16**	8	0.73**	32	0.07
"	"	"	Hybrids	1	9.85**	35	1.08**	35	0.72**	140	0.17
				(% stalk lodging)							
"	"	2-300	Inbreds	1	1661.24**	7	2694.91**	7	233.98**	28	36.52
"	"	"	Hybrids	1	11220.95**	27	690.71**	27	251.47**	108	47.45
"	"	5-600	Inbreds	1	12.61	8	1814.79**	8	297.66**	32	31.83
"	"	"	Hybrids	1	1895.91**	35	436.91**	35	93.83	140	96.65

Table 14. Summary of mean squares from combined analyses of variance for stalk rot ratings taken for 2 or more years at several locations on 5-600 maturity corn

Source of variation	1961, 1962, 1963[a]				1962, 1963[b]			
	Inbreds		Hybrids		Inbreds		Hybrids	
	df	MS	df	MS	df	MS	df	MS
Years (Y)	2	4.38**	2	30.88**	1	8.35**	1	0.15
Locations (L)	1	0.85*	1	29.27**	3	45.99**	3	278.71**
Strain (S)	8	3.11**	35	1.44**	8	2.59**	35	1.60**
Y X L	2	2.67**	2	1.52**	3	1.47**	3	13.73**
Y X S	16	0.35**	70	0.27**	8	0.55**	35	0.47**
L X S	8	1.79**	35	0.63**	24	1.12**	105	0.49**
Y X L X S	16	0.41**	70	0.37**	24	0.34**	105	0.41**
Error a	96	0.13	420	0.08	128	0.12	560	0.11

[a] Ill., Minn. (D).

[b] Ill., Minn. (D), Mo., M. Wis.

A New Method to Characterize the Stability of Hybrids

S.A. Eberhart

Since genotype x environmental interaction is a major problem of the plant breeder in selecting better hybrids, a reduction in the magnitude of this interaction would permit more efficient testing and produce a more desirable hybrid. Contolling the environments by sub-dividing the area into regions of similar climate, the use of fertilizer, etc. has reduced the genotype x environment interaction. But probably further progress by controlling environments does not appear promising.

Selection of more stable genotypes is a second approach that has not been explored adequately. Suitable criteria are necessary before studies can be conducted to measure genetic differences and to permit selection if genetic differences for stability do exist. The regression of each hybrid on an environmental index provides two parameters to measure the stability of the hybrid. These parameters are the slope of the regression line, b_{ℓ}, and the sum of squares of deviations from regression. If the mean of all entries in an experiment is used as this environmental index, the average slope will be unity ($\bar{b}_{\ell} = 1.0$). A stable hybrid by this definition would have a regression coefficient on the environmental index of 1.0, and deviations from regression would be no greater in magnitude than expected due to the experimental error.

The analyses of two single-cross diallels indicated that the single crosses in these two sets differed genetically in their response to favorable and unfavorable environments. Additive gene action was apparently very important in determining this response. The sums of squares due to deviations from regression were no larger than the error for some of the higher yielding single crosses. Inferences from a three-way cross trial were similar. But few differences in stability were detected from two sets of double crosses.

Report of the Sub-Committee for Uniform Tests on Stability and Genotype-Environmental Responses of Hybrid Types

This committee recommends that a study involving the 45 possible single crosses from ten inbred lines and a balanced set of 45 double crosses obtained from the same 10 lines be grown at 6 to 12 locations in the North Central region for a two year period to study the differential response of single crosses and double crosses to varying environmental conditions. Since the sub-committee for the 700-800 maturity series has selected 10 inbred lines and formed the 45 single crosses to obtain performance data from these single crosses, the committee recommends that these same single crosses be utilized. The information on single cross performance could be obtained from the Uniform tests on Stability and Genotype-Environmental Response in 1965 and 1966 if desired.

Ten commercial checks would bring the total number of entries to 100 so that a simple 10 x 10 lattice design could be used at each location. The proposed entries are listed in Table 1. Random numbers were assigned to the 10 inbred lines and the basic plan from 11.16 Experimental Designs by Cochran and Cox with 3 permutations of each block was used for selecting the double cross combinations. It is proposed that the closed pedigree hybrids be coded and only the code be used for identification purposes.

The suggested plot size is approximately 1/392 acre with 2 rows and 20 plants per row giving a stand of nearly 16,000 plants per acre. Data are desired for the characters yield (cwt. per acre at 15.5% moisture), moisture percent, stand percent, ear height grade (1 to 5, with 5 for the tallest plants), root lodging percent (plants leaning more than 30°), stalk lodging percent (lodging below the ear nodes), and percent dropped ears. The data for each location are to be analyzed in these units by

Table 15. Entries for the Uniform Tests on Stability and Genotype-Environmental Responses*

Entry No.	Pedigree	Entry No.	Pedigree
1	B14A x H55	51	(B14AxB45)(H55xN28)
2	B14A x B37	52	(B14AxB37)(N6GxOh7N)
3	B14A x WF9	53	(B14AxN6G)(B37xOh7N)
4	B14A x N28	54	(B14AxOh7N)(B37xN6G)
5	B14A x B45	55	(B14AxWF9)(C103xOh45B)
6	B14A x N6G	56	(B14AxC103)(WF9xOh45B)
7	B14A x Oh7N	57	(B14AxOh45B)(WF9xC103)
8	B14A x C103	58	(B14AxN28)(N6GxC103)
9	B14A x Oh45B	59	(B14AxN6G)(N28xC103)
10	H55 x B37	60	(B14AxC103)(N28xN6G)
11	H55 x WF9	61	(B14AxB45)(Oh7NxOh45B)
12	H55 x N28	62	(B14AxOh7N)(B45xOh45B)
13	H55 x B45	63	(B14AxOh45B)(B45xOh7N)
14	H55 x N6G	64	(H55xB37)(B45xC103)
15	H55 x Oh7N	65	(H55xB45)(B37xC103)
16	H55 x C103	66	(H55xC103)(B37xB45)
17	H55 x Oh45B	67	(H55xWF9)(N6GxOh45B)
18	B37 x WF9	68	(H55xN6G)(WF9xOh45B)
19	B37 x N28	69	(H55xOh45B)(WF9xN6G)
20	B37 x B45	70	(H55xN28)(Oh7NxOh45B)
21	B37 x N6G	71	(H55xOh7N)(N28xOh45B)
22	B37 x Oh7N	72	(H55xOh45B)(N28xOh7N)
23	B37 x C103	73	(H55xN6G)(Oh7NxC103)
24	B37 x Oh45B	74	(H55xOh7N)(N6GxC103)
25	WF9 x N28	75	(H55xC103)(N6GxOh7N)
26	WF9 x B45	76	(B37xN28)(C103xOh45B)
27	WF9 x N6G	77	(B37xC103)(N28xOh45B)
28	WF9 x Oh7N	78	(B37xOh45B)(N28xC103)
29	WF9 x C103	79	(B37xB45)(N6GxOh45B)
30	WF9 x Oh45B	80	(B37xN6G)(B45xOh45B)
31	N28 x B45	81	(B37xOh45B)(B45xN6G)
32	N28 x N6G	82	(B37xWF9)(N28xOh7N)
33	N28 x Oh7N	83	(B37xN28)(WF9xOh7N)
34	N28 x C103	84	(B37xOh7N)(WF9xN28)
35	N28 x Oh45B	85	(WF9xN28)(B45xN6G)
36	B45 x N6G	86	(WF9xB45)(N28xN6G)
37	B45 x Oh7N	87	(WF9xN6G)(N28xB45)
38	B45 x C103	88	(WF9xB45)(Oh7NxC103)
39	B45 x Oh45B	89	(WF9xOh7N)(B45xC103)
40	N6G x Oh7N	90	(WF9xC103)(B45xOh7N)
41	N6G x C103	91	Commercial SC A
42	N6G x Oh45B	92	Commercial SC B
43	Oh7N x C103	93	Commercial SC C
44	Oh7N x Oh45B	94	Commercial SC D
45	C103 x Oh45B	95	Commercial DC A
46	(B14AxH55)(B37xWF9)	96	Commercial DC B
47	(B14AxB37)(H55xWF9)	97	Commercial DC C
48	(B14AxWF9)(H55xB37)	98	AES 702
49	(B14AxH55)(N28xB45)	99	AES 704
50	(B14AxN28)(H55xB45)	100	U.S. 13

* Commercial SC's are Dekalb 805, Pioneer 3304, P.A.G. SX29, and United-Hagie 158
Commercial DC's are Dekalb 633, Funk G 96, and Pioneer 321

the researcher conducting the experiment including covariance adjustments for stand if appropriate. These analyses and adjusted treatment means are to be submitted to the chairman for the combined analyses. Two methods of analysis will be used: (1) the conventional analysis with the estimation of the appropriate variance components as shown in Table 2 for all characters and (2) the analysis based on the environmental index as shown in Table 3 for yield. It is hoped that the final results will be of sufficient value to warrant a joint publication in a scientific journal.

E.R. Leng
E.C. Rossman
M.S. Zuber
S.A. Eberhart, Chairman

Table 16. Analyses of Variance*

Source	d.f.	E(MS)
Total	400ℓ-1	
Years (Y)	1	
Locations (L)	ℓ-1	
Y x L	(ℓ-1)	
Varieties (V)	99	
SC vs DC	1	
Among SC	44	
Among DC	44	
Remainder	10	
V x Y	99	
(SC vs DC)xY	1	
SC x Y	44	$\frac{1}{2}\sigma^2_s + \sigma^2_{sy\ell} + \ell\sigma^2_{sy}$
DC x Y	44	$\frac{1}{2}\sigma^2_d + \sigma^2_{dy\ell} + \ell\sigma^2_{dy}$
Remainder	10	
V x L	99(ℓ-1)	
(SC vs DC) x L	ℓ-1	
SC x L	44(ℓ-1)	$\frac{1}{2}\sigma^2_s + \sigma^2_{sy\ell} + 2\sigma^2_{s\ell}$
DC x L	44(ℓ-1)	$\frac{1}{2}\sigma^2_d + \sigma^2_{dy\ell} + 2\sigma^2_{d\ell}$
Remainder	10(ℓ-1)	
V x Y x L	99(ℓ-1)	
(SC vs DC) x Y x L	(ℓ-1)	
SC x Y x L	44(ℓ-1)	$\frac{1}{2}\sigma^2_s + \sigma^2_{sy\ell}$
DC x Y x L	44(ℓ-1)	$\frac{1}{2}\sigma^2_d + \sigma^2_{dy\ell}$
Remainder	10(ℓ-1)	
Pooled error	198ℓ	
Error (SC)	88ℓ	σ^2_s
Error (DC)	88ℓ	σ^2_d
Remainder	22ℓ	

* The combined analyses will be obtained from entry means.

Table 17. Analysis of Variance for Yield Using the Environmental Index*

Source	D.F.
Total	$400\ell-1$
Env (linear)	1
Varieties (V)	99
SC vs DC	1
Among SC	44
Among DC	44
Remainder	10
Env (L) x V	99
Env(L) x (SC vs DC)	1
Env(L) x SC	44
Env(L) x DC	44
Remainder	10
Deviations	$100(y\ell-2)$
Variety 1	$y\ell-2$
⋮	
Variety 100	$y\ell-2$
Pooled error	198ℓ

* The combined analysis will be obtained from entry means.

REPORT OF THE SUB-COMMITTEE ON GROUPING OF LINES FOR BREEDING PURPOSES

The Group A and B assignments were reviewed and some of the older lines dropped and newly released lines added. A current list is presented below.

GROUP A						
A90	Ia.L317	Ind.33-16	K201	N9	R76	W75
A158	Ia.Os420	Ind.38-11	K201G	N9a	R84	W79A
A165	Ia.Os426	Ind. 66		N25	R103	W117
A188	Ia.153	Ind. B164	Ky201	N38	R105	W153R
A218	Ia.I.159	Ind.Tr	Ky27		R109B	W187R
A223	Ia.I.205	Ind.WF9	Ky49	NC7	R151	W-R3
A254	B6	H14	Ky122		R153	WD
A264	B7	H22	Ky209	ND1	R154	WH
A265	B8	H30	Ky211	ND33	R172	WJ
A277	B9	H45		ND203	R174	W374R
A293	B9A	H46	L97	ND230	R177	W375B
A295	B16	H49	L503	ND255	R181	
A334	B18	H50			R181B	
A344	B36	H51	Mo1W	Oh04	R197	
A374	B41	H52	Mo2RF	Oh4C	R218	
A375	B42	H53	Mo3	Oh5	R218A	
A385	B48	H54	Mo6	Oh13	R219	
A395	B49	H57	Mo7	Oh40B	R220	
A495	B50	H58	Mo8W	Oh41	R221	
A498	B51	H74	Mo9W	Oh43	R222	
A502	B52	H75	Mo10	Oh45	R222A	
A509	B54	H78	Mo11	Oh45A	R223	
A513	B55	H79	Mo12	Oh45B	R903B	
A547	B56	H80	Mo14W	Oh45C	R906	
A548	B57	H81	Mo17	Oh65	R917A	
A551	B60	H82	MoG	Oh67	R941	
A554	B61	H83	Mo13			
A563		H87	Mo21R	Ill.4226	SD48	
A568	C103	H88	Mo22	Ill.A	SD102	
A619		H90		Ill.L	SD105	
A624	CI.2		MS4	Ill.R2	SD107	
A629	CI.7	K6	MS106	Ill.R4		
A631	CI.31	K11	MS116	R53	W8	
	CI.38B	K41	MS211	R59	W10	
Ia.1.224	CI.40	K63		R61	W32	
Ia.1234	CI.127	K148	N6	R71	W37A	
Ia.I289	CI.187-2	K150	N6D	R74	W41A	
	CI.317B		N8[1/]	R75	W64A	

GROUP B

A73	CI.3	K55	Oh3A	R216A
A96	CI.3A	K64	Oh3C	R901
A116	CI.4-8	K155	Oh3F	R902
A166	CI.5	Kys	Oh3K	R904A
A203	CI.21		Oh7A	R907
A204	CI.21A	Ky201	Oh7B	R914
A208	CI.27		Oh7K	R921E
A238	CI.38A	Mo13	Oh7N	R924
A239	CI.42	Mo15W	Oh26	
A251	CI.42A	Mo16W	Oh26A	W22R
A259	CI.64		Oh26C	W33
A286	CI.540	MS1	Oh26D	W59E
A297		MS12	Oh26F	W59M
A340	CMV3	MS24	Oh28	W73
A344	CMD5	MS24A	Oh29	W79A
A347	CM145	MS107	Oh32	W-M13R
A357		MS132	Oh33	W103
A392	Ind.B2	MS206	Oh51	W182
A401	Ind.P8	MS213	Oh51A	W401
A417	Ind.Pr-1	MS214	Oh56	W491
A427	H5	MS1334	Oh56A	W537
A508	H19	MS1341	Oh57	
A546	H21		Oh71	UcBc3
A556	H23	N4		
A561	H28	N7	Ill.90	
A632	H31	N15	Ill.5120B	
A635	H41	N22	Ill. Hy	
	H42	N22A	Ill. Hy2	
B10	H55	N28	Ill. M14	
B14	H56	N35	R30	
B21	H59		R78	
B37	H60	NC34	R101	
B38	H71		R112	
B43	H73	ND5	R113	
B44	H76	ND30	R138	
B45	H84	ND167	R158	
B46	H85	ND211	R159	
B47	H86	ND283	R168	
B53	H89		R182 1/	
B58 1/		NYD1100.3	R192	
B62	K4		R194	
	K12	Oh02	R196 2/	
	K44	Oh07	R216	

Pedigrees of New Lines

Line	Source	Line	Source
A619	A171 x Oh43[2]	MS4	Pickett O.P.
A624	ND230 x A295[2]	MS106	W10 x MS9
A629	CMV3 x WF9[2]	MS107	M14 x NY3
A631	A509 x WF9[4]	MS132	Iowa Stiff Stalk Syn.
A556	B164-886 x A237	MS213	OhM14(Oh51 x Oh26)(A x W23)
A632	Mt42 x B14[4]	MS214	Iowa Stiff Stalk Syn.
A635	ND203 x B14[3]		
		N4	Dower #2
B53	B2 x W24	N6D	N6/Hays Golden
B54	Corn Borer Syn #1	N7	Oh7/Stiff Stalk Sun.
B55	Oh45 x W92	N8	CI.187-2/Stiff Stalk Syn.
B56	Alph x 38-11	N9	38-11 x WF9[3]
B57	Midland O.P.	N9A	WF9/Midland
B58	B18 x A73	N15	Krug x Reid
B59	N32 x B14[2]	N22	Krug Yellow Dent
B60	Minn. Syn. #1	N22A	N22 outcross
B61	[(A206 x M14) x Oh4c]	N25	Redi Yellow Dent
B62	N32 x B14[2]	N35	Krug Yellow Dent
		N28	Stiff Stalk Syn. C1
CI.42A	Mo21A x Hy[3]	N38	WF9 x 38-11[3]
CI.40	CI.23 x Os420[3]		
CI.64	Mo21A x K64[3]	R181	Corn Borer Synthetic #2
CI.127	(L97 x Ky27[2])	R181B	Corn Borer Synthetic #2
		R903B	br_2 recovery of C103
H71	NC34 x W22[2]	R906	br_2 line from Pioneer
H84	B37 x GE440	R914	br_2 recovery of M14
H85	Synthetic B	R917A	br_2 recovery of L317
H86	Synthetic B	R941	br_2 recovery of Oh41
H87	A295 x CI.90	R216	Ht Ht recovery of M14
H88	Oh43 x CI.90A		(G source)
H89	B14 x GE440	R216B	" "
H90	N6 x CI.82B	R218	Ht Ht recover of Oh43
			(G source)
Ky201	White Pearl	R218A	" "
Ky209	38-11 x Ky30A	R219	Ht Ht recovery of Oh43
Ky211	WF9 x Ky39		(L source)
		R220	Ht Ht recovery of 187-2
Mo12	WF9 x Mo22[2]		(G source)
Mo13	Miss. Hyd. 1100.3 x T8[2]	R221	Ht Ht recovery of 187-2
Mo14W	Mo22 x WF9		(L source)
Mo15W	O.P. Pipe Corn	R222	Ht Ht recovery of W64A
Mo16W	O.P. Pipe Corn		(L source)
Mo17	187-2 x C103	R222A	" " "

Pedigree of New Lines (Cont'd.)

Line	Source
R223	<u>Ht</u> <u>Ht</u> recovery of W153R (L source)
R901	<u>br_2</u> line from Pioneer
R902A	<u>br_2</u> recovery of Hy2
R904A	<u>br_2</u> recovery of K4
R907	<u>br_2</u> recovery of Oh7
R921E	<u>br_2</u> recovery of CI.21E
R924	<u>br_2</u> recovery of B14
YuBc3	Maksimir Early Dent (Yugoslavia)
W374R	recovered A374
W375B	(W67 x W28 . W33 x A158)
W401	(W33 x W25 . W67C)
W491	(Arg. Flint x 187-2)
W537	W79 x C18)

Survey On The Use of Station Lines In The Hybrid Seed Corn Industry

G. F. Sprague

A survey of the use of Station lines in the Hybrid Seed Corn Industry was made in 1956 and the results reported in the Minutes of the 1957 Corn Breeding Research Committee. A similar survey was made in 1963 at the request of the Corn Breeding Research Committee. This survey was possible only through the cooperation of Mr. Heckendorn and the members of the Hybrid Seed Corn Division of the American Seed Trade Association.

A list was prepared of the 236 lines released during the period 1946 through 1961. This list was submitted to all members of the Hybrid Seed Corn Division by Mr. Heckendorn with a request that they indicate the number of bushels of double-cross hybrid seed produced in 1962 involving each of the lines listed. Responses were received from over 40 companies with a combined usage of all lines listed of 6,396,117 bushels of seed.

A survey of this sort is subject to various types of bias. Some of the possible limitations are discussed below:

1. Adequacy of the survey.

The combined usage figure of 6,396,117 bushels is equal to approximately half of the yearly seed requirements of the United States. Obviously this estimate of usage is too high because the individual figures are not completely independent. The most conservative estimate would involve a reduction of the total bushels by one-fourth. On this basisthe reported usage would approximate one-eighth of the annual U.S. seed needs. This minimal estimate is undoubtedly too conservative as it ignores the wide-spread use of standard single-cross seed parents such as WF_9 x 38-11. A more realistic compromise would be to divide the total bushel figure by 2. This procedure gives a usage figure equal to approximately one-fourth of the annual seed requirement.

2. Distribution of responses.

Responses were received from the major seed companies. Responses from the smaller seed companies were low in proportion to their numbers. It is within this group that the maximum utilization of released lines would be expected. Information is lacking on response as a function of production capacity. Any bias arising from unequal representation may be of limited importance in terms of total bushels but may be of great importance in estimates of usage of specific lines. Thus, if response was low for northern areas, the usage of lines adapted to such areas would be underestimated.

3. Extent of usage of specific lines.

This survey suggests that a new line cannot be expected to achieve extensive use in less than 4 years. Thus the survey produced little meaningful information on the potential usefulness of recently released lines now in the 1000-5000 bushel class. The zero utilization class is a hodgepodge ranging from new lines which are currently under observation to older lines which were used at one time but have since been replaced by newer introductions.

Two points arising from this survey appear to be of considerable interest. First a few lines have come into wide-spread use and contribute significantly to the excellence of the hybrids currently grown. Secondly, the great majority of released lines have found no more than limited acceptance by the Hybrid Seed Corn Industry.

Inbred lines released from 1946 through 1961 and the number of bushels of double-crossed hybrid seed of the 1962 crop of which these lines were a parent

<u>500,000 or more bushels</u>
B14, C103, Oh43

<u>201,000-500,000 bushels</u>
B37, Oh41

<u>151,000-200,000 bushels</u>
W153R

<u>101,000-150,000 bushels</u>
Oh45, R61, W64a

<u>51,000-100,000 bushels</u>
A12, A73, A257, K64, W22

<u>1000-50,000 bushels</u>
A90, A96, A116, A158, A239, A251, A264, A295, A340, A374, A427, A495, A498, A508, A509, A545, A556; B6, B8, B10, B16, B38, B41, B42; C102; CV3; CI.21, CI.21E, CI.31, CI.44, CI.64, CI.66, CI.90A; F6, F44; GT112; P8, H21, H23, H49, H55, H59; K55, K148, K150, K155, K201; Mo5; MS24, MS206, MS1334; N6D, N22A; NC7; ND203, NY3, NY16; Oh5, Oh7a, Oh7B, Oh26A, Oh29, Oh51; R59, R75, R76, R78, R84, R168; WD, W8, W9, W10, W23, W37a, W49, W-M13, W-M13R, WR3,W22R, W32, W33, W59E, W59M, W79a, W187R, W182B, W182D.

<u>No usage reported</u>

A7, A15, A21, A25, A34, A71, A111, A131, A148, A165, A166, A171, A188, A203, A208, A218, A223, A236, A265, A297, A305, A308, A310, A311, A312, A322, A334, A344, A347, A357, A375, A385, A392, A395, A401, A417, A502, A513.

C11, C11 Imp. C14, C14 Imp. C15, C16, C19, C20, Imp. 91;

B7, B47; C101, C105, C106, C107; CI.27. CI.28A, CI.29B, CI.38B, CI.40, CI.42A, CI.45, CI.49B, CI.82B, CI.85B, CI.86B, CI.88A, CI.91B, CI.94, CI.95B, CI.317B;

COM49, COR19B; H22, H50, H52, H60; K6, K41, K63; Mo1w, Mo2Rf, Mo3, Mo6, Mo7, Mo22; MS12, MS24a, MS116, MS211; N1, N9, N15, N38;

NC13, NC33, NC34; ND1, ND5, ND30, ND36, ND167, ND211, ND230, ND255, ND283, ND363, ND405, ND468; NY1, NY2, NY4; Oh56A; R53, R71, R74, R101, R109B, R113, R134, R151, R177, R182; SD5;

WH, WI, W8, W16, W20, W24A, W25, W26, W28, W41a, W75.

AFTERNOON SESSION, March 4

Dr. R. J. Dimler of the Northern Utilization Research and Development Division reported on the various lines of research under way at Peoria involving corn. This presentation was followed by short reports on topics of interest to the committee. A resumé of these talks follows:

UTILIZATION RESEARCH ON CORN AT THE NORTHERN DIVISION

R. J. Dimler, Chief, Cereal Properties Laboratory

The Department of Agriculture's Northern Utilization Research and Development Division at Peoria is responsible for research on cereal grains (particularly corn, wheat and sorghum), oilseed crops (particularly soybean and linseed), and new crops (screening and then detailed research on selected plant products). After a brief outline of the applied and basic research on cereal grains, selected examples of current and recent research on corn were described.

Studies on dry milling of corn, directed toward improved degermination while retaining good grit size, has included investigation of effect of variables in present-type operations as well as progress in development of improved experimental milling equipment.

Fermentative transformations and the use of enzymes from microorganisms provide avenues to new or more economical products from corn and its starch. Examples of research in this area are production of new microbial polysaccharides which impart stable high viscosity to water solutions and have possible use, for example, as thickening agents in solutions for oil well drilling and for fighting forest fires; improved production of β-carotene through use of mating strains of *Blakeslea trispora*; enzymic conversion of whole ground corn to solutions of D-glucose to provide an economical source of glucose for fermentation; and biological insecticides, with current emphasis on production of spores of the organism responsible for milky disease of the Japanese beetle grub.

Research on high-amylose corn includes formal cooperation with Dr. Zuber at Missouri and another groups of breeders on analysis of samples; investigation of the structure and properties of the starch granules, and of the molecular components obtained by fractionation; studies on film formation and properties; and investigations on behavior in wet-milling for starch isolation. Another area of research including a breeding effort is on xanthophylls of corn, including cooperation with Dr. Grogan at Mississippi. Studies also include the characterization of individual xanthophylls and determination of changes during wet-milling or other processing of the corn.

The chemical approach to developing new products from starch is emphasized. A promising current development is a urethane foam for which starch is an economical starting material. Products for use in papermaking are of special interest because of the magnitude of this market. Considerable success is being realized in the introduction of dialdehyde starch, obtained by oxidizing starch with periodic acid using an electrolytic process developed at the Northern Division. Incorporation of dialdehyde starch in paper gives high wet-strength along with other advantages. Paper toweling is one of the many possible outlets for such material.

Estimation of soil variability and convenient plot size from corn trials

Arnel R. Hallauer

Several procedures have been proposed for estimating soil heterogeneity, but it appears the one derived by H.F. Smith (J. Agric. Sci. 28:1-23. 1938) is the most useful. Smith evaluated uniformity data and showed empirically that the logarithm of the variance between plots of a given size was linearly related to the logarithm of the size of the plot. It has been shown by subsequent investigators (Koch and Rigney. Agron. J. 1951 and Hathaway and Williams Biom. 1958) that the same information can be obtained from experimental trials involving different treatment effects. In logarithmic form, the index of soil variability is estimated as a linear regression coefficient and varies between zero and unity--the larger the value the lower the correlation between adjacent units.

Using the relation proposed by Smith, estimates of soil variability were obtained from 217 experimental corn yield trials grown at 15 test sites in Iowa. The combined estimate from all trials was 0.46 ±.01 with the combined estimates over years for each location ranging from 0.36 to 0.78. All estimates were obtained using a weighted least squares analysis which permitted one to determine the sums of squares due to regression and to test the departure from regression. The appropriate test was made and only 37 of the 217 experiments analyzed had significant deviations from a linear model. When the sum of squares due to regression is compared with the total sum of squares for all experiments, approximately 87.5% of the total sum of squares is due to regression. Therefore, it appears the empirical relation derived by Smith is useful for estimating an index of soil variability.

Generally research workers are more interested in designing experiments that are capable of detecting true differences of a specified size, irrespective of costs. If the index of soil variability and the coefficients of variability can be estimated from experimental data, convenient combinations of plot size and number of replications can be determined that will detect true differences at a specified probability level. Using the estimated soil indicies and coefficients of variability from the same experiments, convenient combinations of plot size were calculated and presented in graph form.

Improvement of Yield Potential in Corn on a Physiological Basis

Edwin E. Gamble

Improvement of yield potential continues to be a major objective in most corn breeding programs. Small consistent gains have been made in yield potential by selection and testing of inbred lines and hybrids. However, we have had no major advances in yield since we first utilized hybrid vigor.

In order to increase yield potential of corn we must look to the basis of yield. 90% to 95% of corn yield is a product of photosynthesis during the life of the crop. Total annual photosynthesis of a crop depends not only on the size of the photosynthetic system but also on its efficiency and the time and length during which it is active. Since photosynthesis, in turn, is essentially dependent on light, we can say that yield is dependent on the efficiency of utilization of available light by the crop.

Increased efficiency of utilization of light can be obtained by (1) modification of the phasic development of the corn plant, and (2) modification of the morphology of the plant, particularly in respect to the leaves.

Since light availability is maximum at the end of June, it is suggested to increase yield that corn plants should have completed flowering, and initiated the development of grain at this time. This would take advantage of the greater availability of light in July than in August and September for grain production.

Development of plant types which permit greater penetration of light to lower leaves and thus more photosynthesis in these leaves will also serve to increase yield. Plant types with more upright leaves, narrow leaves, variation in arrangement of leaves, etc. will permit greater penetration of light to all leaves of the plant.

An essential consideration in the use of modified plant types described above is the production practices. To best utilize and obtain maximum yield per acre from the modified plants, it is necessary to modify the planting pattern from a 40-inch row to a spatial arrangement. The preferred arrangement appears to be a triangle or "staggered" rectangle with equal spacing between plants. Such a planting pattern utilizes available light and moisture more efficiently.

The Effects on Yield of First and Second Brood European Corn Borer Infestations

Gene E. Scott

Our research with the European corn borer is conducted in cooperation with personnel from the Federal Corn Borer Laboratory, Ankeny, Iowa. Two studies on corn borer research were summarized for this report. The first of these dealt only with first brood corn borer infestation. Four single crosses were chosen for this test with one single cross being resistant to corn borer leaf feeding. The four hybrids were grown at 0 or 90 lbs/acre added nitrogen, population levels of approximately 7, 14, and 21 thousand plants/acre and under corn borer treatments of either hand infestation with corn borer egg mass or sprayed to control corn borers. Results were obtained in 1958, 1961, and 1962. However, the hybrids grown in 1958 differed from those grown in 1961 and 1962. The leaf feeding resistance of the inbred line C.I.31A was effective in reducing the leaf feeding ratings on the single cross B14 x C.I.31A in 1961 and 1962, and even more effective when crossed with the resistant line Oh45 and grown in 1958. This leaf feeding resistance was also effective in reducing the amount of yield loss of the different single crosses. For instance, in 1962 the average percent yield reduction for the three susceptible single crosses was more than 17% compared to less than 3% loss for B14 x C.I.31A. Corn which received added nitrogen apparently increased borer survival because the percentage of yield reduction was higher on these plots than those which did not receive the added nitrogen. In each of the three years the percentage of yield loss increased with an increase in population level. Apparently, the greater the stress under which the plant is growing the larger the effect corn borer infestation will have on yield. Stalk lodging was increased by nitrogen fertilizer, increasing stands, and infestation by European corn borers.

Another study was conducted during these same three years which compared infestation with both first and second brood, first brood alone, and second brood alone with plots sprayed to control all infestation. The initial test in 1958 included one double cross in each of the 5-600, 700, 800, and 900 regional maturity groups. In 1961 and 1962 two additional double crosses in each of the 4 maturity groups were included in the test. The results from this study indicate that first brood infestation causes a greater yield loss than does second brood infestation, but both broods cause yield reductions. Yield reductions from second brood infestation in the earliest maturity group was slight, but yield losses in the other 3 maturity groups were greater but similar. This suggests that the earlier the infestation the greater the yield loss, but this linear response was not great; possibly because the spread in maturity (approximately 1 week difference in silking dates) among the 3 later maturity groups was not large enough to produce differential response. First brood infestation increased stalk lodging, but differences in stalk lodging under second brood infestation were not evident under the conditions of this test.

MORNING SESSION, March 4

The morning session was devoted to a consideration of reports from the various standing committees and the business meeting.

Report of the Sub-Committee on the 900 Maturity Series

In 1964, single cross trials will be conducted in both a yellow and a white endosperm series. Twenty]eight lines were nominated for the yellow series and were crossed to four inbred testers in 1963 at Lexington, Kentucky. Inbreds used as testers were H49, B37, Oh7a and Mo6. This will permit the prediction of double cross hybrids relative to the 6 potential seed parents involving the 4 tester lines. Due to insufficient seed of certain single crosses, only 94 items will be available for testing. Nominated lines are listed below with their origin:

Yellow Inbreds	Origin
AKh48	Dortch 400
AKd50	(L317 x L510) x Tx1730
Mo13	Miss. Hyb. x T8
Mo4524	C103 x 187-2
N30	Krug I. Synthetic
R134	------------
R215	Pioneer Long Ear (x)
T218	T13 x CI.7
T224	T115 x (I205 x L289)
Va17	WF9 x T8
Va36	C103 x T8
C103	
Oh29	
CI.21E	
CI.38B	
Oh7B	
Ky36-11	Bates O.P.
Ky61-1903	Ia.Syn. B 3339-1-81-1-1-1-1
Ky61-1967	Ia.Syn. B3339-241-2-2-1-2
Ky61-1984	Ia.Syn. B. 3339-254-2-2-1-2
Ky61-2063	Ia.Syn.A 3336-15-2-1-1-1
Ky61-2122	Ia.Syn A 3336-42-3-1-2-1
Ky61-2154	Ia.Syn. A 3336-712-4-4-1-2
Ky61-2210	Lancaster 8774-43-2-2-1-1-1
Ky61-2218	Lancaster 8774-68-2-1-2-1-1
Ky61-2338	NC Ia DDC x Cuba 38 1000A-1-3-1-1-1
Ky61-2341	NC Ia DDC x Cuba 38 1000A-17-3-1-1-2
Ky59-3445-1	Ky126 O.P.

The yellow series will be evaluated in Nebraska, Illinois, Missouri, Kentucky, Virginia and Arkansas in 1964. Seed will be distributed by Kentucky.

The 30 nominated white lines were crossed to three tester inbreds in 1963 at Lexington, Kentucky. The tester lines are CI.64, Ky211 and Ky201. Eighty-one single crosses will be evaluated in 1964 in Missouri and Kentucky. Nominated lines together with their origin are listed below:

White inbreds	Origin
Mo11883W	(K64 x Mo22) Boone Co. White
Mo12014W	Boone Co. White x Ky26
T115	Jellicorse
T315	T111 x (Richbred L x Ill.A)

White Inbreds

White Inbreds	Origin
CI.66	W.S. 19
Ky217	W.W. 10
Ky216	Mo22 x WF9
Mo14W	Pride of Saline
K6	Ia Syn B 3339-256-1-2-1-1
Ky61-2022W	Ia Syn B 3339-283-3-1-1-1
Ky61-2023W	Ia Syn B 3339-283-2-1-2-1
Ky61-2026W	Ia Syn A 3336-15-1-4-1-1
Ky61-2077W	Ia Syn A 3336-15-5-4-1-6
Ky61-2107W	Ia Syn A 3336-36-4-2-1-1
Ky61-2261W	Boone Co. Wh. 3342-313-1-1-1-3
Ky61-2291W	Boone Co.Wh. 3342-368-2-2-2-1
Ky61-2301W	Boone Co.Wh. 3342-377-2-2-2-3
Ky61-2328W	Boone Co.Wh. 3342-447-1-2-1
Ky61-2331W	Ia DDC x Coah 8 997-7-1-1-1-1-1
Ky61-2334W	Ia DDC x Coah 8 997-4-1-3-1-1
Ky61-2375W	Potch Pearl 961-25-1-2-1-2
Ky61-2428W	Pride of Saline 3345-569-1-3-1-3
Ky61-2463W	Pride of Saline 3345-639-2-3-2-1
Ky61-2463W	Pride of Saline 3345-639-2-3-2-1
Ky62-2488W	Rec. Blight Rest. Ky27
CI.127	Rec. Blight Resist. Ky26
Ky27	Boone County White
Ky57-256	M14 x Ky45-66
F163	(A14 x K44)K44
K9515	Tc K2275 x B3(S4)

C. F. Genter
F. A. Loeffel
M. S. Zuber, Chairman

REPORT OF THE SUBCOMMITTEE ON UNIFORM TESTS IN THE 700-800 MATURITY SERIES

No double-cross trials were conducted in 1963, and none will be conducted in 1964.

A combined 700-800 maturity 3-way trial was conducted in 1963. Data were reported from Illinois, Iowa, Kansas, Kentucky, Missouri, Nebraska, Ohio, Pennsylvania and Virginia. Summarized data for all characters are presented in table 18. Detailed data on yields are presented for each state in table 19.

Three-way cross seed available for testing in 1964 represent a combined 700 and 800 trial in which the two testers are WF9 x Hy and B37 x Oh7N. The crosses of which adequate seed is available are as follows:

Line	Pedigree	WF9 x Hy	B37 x Oh7N
Ia.62:1214	H.D. 2187	x	x
Ia.62:1243	Synthetic B	x	x
Ia.62:1586	B18 x A73	x	x
R214	Pioneer Long Ear	x	x
Ind.Ob.61:5-9	Synthetic B.	x	x
Ind.Ob.61:80-13	Snythetic B	x	x
Ky 61-2187	Lancaster	x	x
Ky 61-2210	Lancaster	x	x
Ky 61-2218	Lancaster	x	x
Pa. 422P	[(Oh04 x WC34)A71]x[M14 x K155]	x	x
Pa. 419P	Ullstrup Hy x Jenkins Hy	--	x
Va.43	Long Ear Synthetic	x	x
Va.44	K201 x C103[3]	x	x
NC6		x	x
C103		x	x

Seed is available for testing in 1964 of all possible single crosses among the following ten inbred lines: B14A, B37, B45, C103, H55, N6G, N28, Oh7N, Oh45B, WF9. Since these single crosses will be included in the stability trials to be grown in 1965 and 1966 they will not be tested uniformly in 1964.

Earl R. Leng
Lowell H. Penny
Wm. R. Findley, Jr.

Table 18 Summary of agronomic data obtained in the uniform regional test of 700-800 maturity three-way crosses grown at nine locations in 1963.

Pedigree	Acre yield bu.	Moist %	50% silked	Stalk lodging %	Leaf blight rating (1-5)	Corn borer rating (1-9)	Dropped ears %	Ear ht. grade	Ears per 100 plants	Diplodia score (1-6)	Stand %
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(WF9 x Hy) x Ia.61:1264	89.4	18.3	85	11.0	2.9	5.3	1.5	3.4	97	1.8	97
x Ia.61:1266	97.1	18.4	82	11.7	1.8	4.7	2.3	3.7	92	2.7	96
x Ia.61:1275	93.7	18.2	84	16.0	2.1	6.0	0.8	3.5	97	2.1	98
x H 81	85.2	19.3	87	7.9	2.7	6.0	3.6	3.1	98	1.8	95
x H 82	91.5	19.7	86	17.2	2.4	6.0	2.0	3.3	99	3.5	95
x H 83	86.8	17.1	84	10.7	2.9	6.0	4.3	3.4	97	1.6	96
x N6G	95.4	18.6	89	17.1	2.4	5.3	1.7	3.3	91	2.0	95
x N13	96.4	18.3	86	15.1	2.7	4.7	2.7	3.9	97	2.6	97
x N2276-6-2	89.3	18.9	88	14.8	2.7	6.3	3.2	3.8	86	2.4	97
x N2155-16-2	91.4	19.0	87	20.9	2.4	6.7	2.2	3.7	97	3.3	95
x N2385-27-2	87.8	18.0	86	21.1	2.5	6.3	7.9	3.7	95	2.2	95
x N2146-1-2	82.0	19.1	87	7.5	2.3	7.3	3.4	3.7	85	2.1	97
x N313-5-1	75.3	16.7	89	12.5	2.6	5.3	1.0	3.4	88	3.6	96
x N368-9-7	82.7	17.0	89	20.8	2.5	5.0	1.7	3.7	91	2.9	96
x N3106-7-1	77.7	16.5	87	20.8	1.8	6.3	2.6	3.6	88	2.5	94
x Pa.884P	93.7	17.4	85	15.9	1.7	6.3	4.1	3.4	92	3.1	96
x R182	78.8	16.4	85	7.8	2.3	6.3	2.9	3.7	93	2.6	97
(WF9 x Hy 2) x Va.41	98.7	20.6	84	11.5	1.7	4.0	1.7	3.3	98	2.5	97
x Va. 42	----	----	86	----	2.7	6.7	---	---	101	1.0	--
x N6	----	----	86	----	---	5.3	---	3.1	92	1.4	--
Mean	88.5	18.2	86	14.5	2.4	5.8	2.8	3.5	94	2.4	9.6

Table 18 . (continued)

Pedigree	Acre yield bu.	Moist %	50% silked	Stalk lodging %	Leaf blight rating (1-5)	Corn borer rating (1-9)	Dropped ears %	Ear ht. grade	Ears per 100 plants	Diplodia score (1-6)	Stand %
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(B37 x Oh7N) x Ia.61:1254	94.9	19.3	85	10.9	2.5	4.3	1.7	3.3	97	1.8	97
x Ia.61:1266	103.2	18.3	85	10.4	1.2	5.7	0.5	4.1	100	2.3	96
x Ia.61:1275	93.4	19.8	85	12.9	2.4	5.7	0.5	3.4	98	2.3	96
x H 81	92.5	20.2	88	5.8	2.6	5.7	0.4	3.2	98	1.8	97
x H 82	93.4	19.7	85	16.6	1.9	5.7	1.0	3.4	98	4.6	96
x H 83	95.6	17.8	84	8.3	3.1	5.7	1.7	3.2	100	1.9	97
x N6G	104.7	19.7	85	15.5	2.4	6.0	1.0	3.4	98	2.5	97
x N13	104.0	19.5	88	12.1	2.4	5.3	0.7	3.8	103	2.5	98
x N2276-6-2	103.6	20.9	89	11.5	1.9	5.3	1.3	3.9	92	2.4	97
x N2155-16-2	100.1	19.6	88	19.4	2.4	5.7	1.0	3.6	94	2.0	96
x N2385-27-2	105.3	19.2	88	15.2	1.5	5.7	4.2	3.8	95	2.0	95
x N2146-1-2	101.0	19.4	88	9.3	2.4	6.7	0.7	4.0	94	2.4	97
x N313-5-1	98.8	18.5	88	13.1	2.5	6.0	0.0	3.6	93	3.4	97
x N368-9-7	107.1	18.5	88	16.3	2.4	6.3	1.7	3.6	97	4.1	98
x N3106-7-1	99.2	17.6	89	14.8	1.6	6.0	2.1	3.8	90	2.0	96
x Pa.884P	102.2	18.2	87	9.0	1.7	7.0	1.8	3.4	101	2.5	96
x R182	99.6	17.4	84	4.4	2.2	6.3	0.0	3.5	94	3.2	96
x Va. 41	92.3	20.2	84	13.3	2.4	5.0	0.3	3.1	91	2.8	94
x Va. 42	97.2	19.2	85	14.8	2.0	6.7	1.6	3.6	94	2.0	97
Mean	99.4	19.1	87	12.3	2.2	5.8	1.2	3.6	96	2.6	96

(1) Ill.,Ia.,Kans.,Ky.,Mo.,Nebr.,Ohio,Pa., and Va.
(2) Ill.,Ia.,Kans.,Ky.,Mo.,Nebr.,Ohio,Pa. and Va.
(3) Ohio
(4) Ill.,Ia.,Ky.,Mo.,Nebr.,Ohio,Pa., and Va.
(5) Pa.
(6) Ia. (Scott and Pesho)
(7) Nebr. and Mo.
(8) Ky.,Mo. and Ohio
(9) Ohio
(10) Ill. (Hooker)
(11) Ill.,Ia.,Ky.,Mo.,Ohio and Pa.

Table 19. Yields obtained in the individual states in the uniform regional trials of 700-800 maturity three-way crosses.

Pedigree		State								
		Ill.	Ia.	Kans.	Ky.	Mo.	Nebr.	Ohio	Pa.	Va.
(WF9 x Hy)	x Ia.61:1264	87.9	127.9	12.9	124.2	91.1	108.4	115.2	56.0	81.0
	x Ia.61:1266	102.9	135.5	27.6	134.7	96.6	110.5	122.1	64.3	80.1
	x Ia.61:1275	96.9	128.2	23.3	126.5	100.7	105.6	110.3	66.1	86.0
	x H 81	82.2	108.6	13.4	118.0	88.2	93.9	121.6	61.6	78.9
	x H 82	91.6	119.6	8.9	134.5	92.9	109.2	119.2	69.5	78.3
	x H 83	76.1	118.6	25.5	117.0	88.6	105.8	116.8	53.4	79.7
	x N6G	99.4	125.0	31.0	128.6	100.2	120.6	103.0	62.0	88.8
	x N13	99.1	137.5	23.7	131.6	94.7	122.8	114.1	65.0	79.3
	x N2276-6-2	87.8	127.3	8.7	125.0	95.0	107.2	114.3	78.5	59.5
	x N2155-16-2	85.4	125.2	19.9	128.8	93.4	118.2	125.9	66.5	58.9
	x N2385-27-2	83.7	134.3	6.4	125.5	95.8	102.5	113.2	61.8	66.7
	x N2146-1-2	87.1	118.6	9.0	119.9	70.6	94.1	117.1	55.6	66.4
	x N313-5-1	78.3	110.7	12.5	108.3	76.6	94.1	98.8	44.1	54.6
	x N368-9-7	83.8	121.6	9.1	125.1	90.7	101.4	113.7	44.0	55.0
	x N3106-7-1	71.2	115.5	9.4	113.0	84.9	96.6	108.2	54.7	45.7
	x Pa.884P	92.7	137.0	19.3	126.0	98.5	105.6	110.8	62.7	91.0
	x R182	78.9	118.0	8.4	106.0	73.7	90.4	103.9	61.2	68.8
(WF9 x Hy 2)	x Va. 41	94.8	134.3	32.9	134.1	91.7	121.8	119.2	65.0	94.9
	x Va. 42	77.8	139.1	22.4	-----	----	106.2	128.2	52.1	76.3
	x N6	----	128.7	34.1	120.7	95.4	117.9	101.8	----	----
(B37 x Oh7N)	x Ia.61:1264	94.9	139.1	22.0	133.6	90.6	98.9	134.7	56.6	83.4
	x Ia.61:1266	117.2	144.1	27.0	141.6	92.9	105.0	135.4	75.9	89.6
	x Ia.61:1275	96.5	130.4	26.3	120.4	78.7	100.0	117.3	76.2	94.6
	x H 81	84.9	127.3	30.3	131.0	88.7	101.2	126.7	68.9	73.6
	x H 82	94.7	142.1	22.1	127.3	82.9	100.2	124.7	67.0	79.7

Table 19. (continued)

Pedigree	State								
	Ill.	Ia.	Kans.	Ky.	Mo.	Nebr.	Ohio	Pa.	Va.
(B37 x Oh7N) x H 83	88.7	131.8	29.7	112.7	90.3	105.0	126.5	73.2	102.7
x N6G	98.4	150.0	23.6	139.2	104.0	120.4	133.4	72.5	101.2
x N13	101.8	141.1	33.9	136.5	96.9	127.9	137.7	63.8	96.2
x N2276-6-2	101.3	143.9	31.4	141.0	99.7	128.3	129.9	79.0	78.1
x N2155-16-2	91.2	136.8	26.1	134.9	96.3	120.6	127.7	80.0	87.3
x N2385-27-2	104.8	156.2	43.2	132.3	89.6	123.2	129.3	81.4	87.9
x N2146-1-2	100.6	151.6	16.2	141.1	101.0	107.8	143.3	69.9	77.6
x N313-5-1	100.2	137.9	14.1	133.4	102.2	118.4	119.0	85.3	78.6
x N368-9-7	111.8	148.7	29.5	149.8	104.3	129.4	139.0	78.6	72.9
x N3106-7-1	100.2	146.1	12.9	135.7	99.1	117.8	129.5	68.9	83.0
x Pa.884P	103.9	139.8	29.6	124.9	100.0	111.8	144.7	73.0	92.2
x R182	112.1	130.7	30.9	125.9	90.5	111.9	128.0	78.8	87.8
x Va. 41	103.6	162.0	15.9	122.7	83.0	99.9	109.4	51.6	82.5
x Va. 42	87.3	128.7	13.8	133.8	92.9	115.0	131.4	79.6	92.6

Proposed Report of the Sub-Committee on Uniform Tests in the
400-600 Maturity Series

Twelve inbred lines, nominated by three states, were evaluated in 3-way cross combinations by 9 states during 1963. The single-cross testers employed were WF9 x M14 and W64A x Oh43. The test-cross combination, (WF9 x M14) N61-12 is a recovered M14 line. A summary of the results from all states is given in table 20. General information regarding the field trials and growth conditions are given below by states.

State	Location	Reps/Loc	Population 1000/A.	Growth Conditions
Minnesota	2	2	17.9 & 15.7	Very good.
Iowa	1	3	16.0	Moisture stress in late June. Some rootworm resulting in lodging.
Missouri	1	4	12.9	
Indiana	1	4	17.3	Picker-shelled.
Michigan	2	3	16.7 & 17.6	Unusually dry, frost on June 22. Picker-shelled.
Ohio	1	4	21.0	Cooler and drier than normal.
Nebraska	1	2	13.0	Irrigated, Optimum conditions. Artifically infested with late-brood borer.
So. Dakota	1	4	11.7	Good for S. Dak. Some rootworm, probably spotted in field.
Pennsylvania	1	3		Picker-shelled.

There will not be a 3-way trial during 1964 due to an insufficient number of nominations.

The following lines and testers were nominated for 3-way test-cross evaluation in 1965:

Lines	Origin
YuBc-4	(WF9 x M14)
N9-1336	(N6 x Hays Golden)
N8-1613	(Barkers Reid 1823 x 2104)
NO-1030	(M14 x 187-2)
A629	(V3 x WF9)WF9$_1$
A631	(A509 x WF9)WF9$_3$
A632	(Mt42 x B14)B14$_3$
A635	(ND203 x B14)B14$_2$
H87	(A295 x CI.90A)
H88	(Oh43 x CI.90A)
Pa.41	

TESTERS

A239 x R181
A622 x R168

L. F. Bauman
E. C. Rossman
J. C. Sentz, Chairman

Table 20.

Summary of Performance Data from North Central Regional 3-Way Cross Trials of Lines in the 400 to 600 Maturity Grouping.

Pedigree	Yield/1 Bu/A	Moisture/1 %	Root/3 Lodged %	Stalk/2 Breakage %	Dropped/4 Ears/100 plants	Ear Height Inches/5	Ear Height Grade/6	Days/7 to 1/2 silk	Smut/7 %	Corn/8 Borer Grade 1-9	Stand/2 %	Good/10 Ears/100 Plants	Barren/10 Plants %
WF9 x M14	100	20.3	13	11	0.7	35	2.3	74	1	7.3	96	93	5
(WF9 x M14) x Ms200	82	19.9	6	17	0.8	38	2.3	75	6	6.7	98	84	6
" Ms201	95	21.3	11	13	0.3	36	2.3	73	5	5.3	99	93	4
" Ms202	106	20.4	5	8	0.5	33	3.0	75	3	5.0	99	89	7
" Ms205	104	19.2	9	6	1.6	41	3.0	75	2	4.7	98	90	4
" Ms216	92	22.3	8	7	3.1	38	2.9	72	26	5.3	97	87	6
" Ms91	89	17.3	2	5	2.0	35	3.0	73	9	6.0	96	91	5
" Ia61:1246	109	18.9	4	5	0.8	40	2.9	74	5	6.3	98	85	3
" N51-2	98	20.6	15	12	0.0	38	3.0	77	10	7.0	99	87	4
" N51-3	94	19.2	19	6	0.6	39	3.1	74	10	6.7	97	93	4
" N51-10	102	20.1	20	9	1.3	42	3.2	74	6	8.0	99	91	2
" N51-11	90	17.5	34	13	0.3	35	2.8	72	8	7.7	97	96	2
W64A x Oh43	106	20.3	4	5	0.7	32	2.6	73	6	5.3	98	93	1
(W64A x Oh43) x Ms200	97	19.4	3	10	1.1	34	2.9	73	11	6.7	99	88	5
" Ms201	94	21.7	4	11	0.9	33	2.3	72	16	5.0	98	92	2
" Ms202	99	20.6	1	6	0.5	33	2.8	75	6	4.3	98	94	2
" Ms205	104	20.0	4	8	0.6	38	3.0	75	5	4.0	98	89	2
" Ms216	86	22.4	6	6	1.1	36	2.9	72	21	3.7	98	85	3
" Ms91	92	16.5	3	5	1.2	38	3.1	72	7	4.3	98	89	2
" Ia61:1246	103	19.4	2	4	0.5	37	3.0	73	3	5.7	99	93	3
" N51-2	100	20.2	13	13	0.2	37	2.8	74	12	7.0	99	95	2
" N51-3	91	19.7	13	4	0.2	36	2.8	73	16	5.7	98	91	3
" N51-10	103	21.0	11	6	1.1	39	3.2	74	6	7.3	97	89	2
" N51-11	90	17.4	24	9	0.9	34	2.3	72	14	6.7	97	93	2
" N51-12	96	20.8	4	3	0.2	35	2.8	74	3	5.3	98	98	3
[illegible]	92	19.3	6	7	2.2	38	3.1	75	9	6.0	99	91	4
[illegible]	86	18.3	10	14	1.0	41	3.0	73	5	6.0	98	87	8

1. Minnesota, Iowa, Missouri, Indiana, Michigan, Ohio, Nebraska, South Dakota and Pennsylvania.
2. Minnesota, Iowa, Missouri, Indiana, Michigan, Ohio, Nebraska, and Pennsylvania.
3. Minnesota, Iowa, Missouri, Indiana, Michigan and South Dakota.
4. Minnesota, Iowa, Missouri, and Nebraska.
5. Minnesota and Indiana.
6. Iowa and Missouri.
7. Indiana and Ohio.
8. Ankeny, Iowa; leaf feeding ratings.
9. Indiana, Missouri, Iowa and Ohio.
10. Ohio

REPORT OF THE SUBCOMMITTEE ON UNIFORM TESTS OF THE 100,200, 300 MATURITY SERIES

Thirteen hybrids, nominated by four states, were tested on a regional basis. To these were added standard hybrids and others according to the wishes of the cooperating states. Data are presented in tables 21-23.

North Dakota supplied seed of top-crosses for evaluating stalk rot resistance for a number of inbred lines. Data are presented in tables 24-26.

Fifteen inbred lines will be submitted by 5 states for crossing on two single-cross testers. Pennsylvania and Wisconsin (Spooner) will produce seed of these three-way crosses in 1964. It is planned that tests of this material will be grown at seven locations in 1965.

Table 21. Yield in bushels per acre for double-cross regional trials of 100-300 maturity in 1963.

Hybrid	Pedigree	Mich.	Spooner	Penn.	N. Dakota	S. Dakota	Minn.
AES 202	W59M x CMD5 . MS1334 x A509	57.4					
Mich. 250	Oh51 x R53 . W10 x MS206	62.5		42.3			
Mich. 270	MS1334 x B8 . W10 x MS206	69.4	114.7	49.3	79.3	76.8	
Mich. 300	MS1334 x MS211 . W10 x MS206	67.6		49.0			
N.D. 85	ND468 x ND363 . B8 x A90	39.2	110.0	64.1	82.4	62.8	85
N.D. 101	ND474 x ND203 . B8 x A90	54.2	119.4	59.8	76.7	72.8	93
N.D. 103	ND405 x ND363 . B8 x A90	55.0	116.7	55.0	78.5	68.9	83
N.D. 105	ND474 x ND407 . B8 x A90	47.1	126.0	62.1	77.7	75.9	86
Minn. 806	A509 x MS1334 . 182B x A544	62.8	110.5	59.6	80.2	64.5	98
Minn. 207	A509 x W59M . 182B x A544	42.3	107.7	52.7	75.2	65.9	89
Minn. 211	A575 x W59M . 182B x A544	48.8	119.0	52.9	75.6	62.7	94
Minn. 212	W33 x MS1334 . A554 x A575	56.0	116.5	46.6	72.9	62.8	98
Wis. 1691	W59E x W271K . W617	37.1	103.6	46.6	69.9		79
Wis. 1694	W59E x W613 . W73A	52.1	120.2	35.9	68.0		81
Wis. 1703	W59E x W609 . W73A	58.8	120.3	49.0	77.2		78
Wis. 260	W59E x W41A . W401 x W182B	61.4	106.6				
Wis. 269	W182B x W375B . W491 x W537	67.4					
Wis. 273	W59M x W117 . W182B x W182E	55.6	123.5				93
Wis. 346	W59M x W117 . W153R x W37A	64.2					
Wis. 335A	W153R x W37A . M13R x W132B	59.4					
Wis. 415	W64A x W182E . W153R x W37A	68.2					
Minn. 613	A239 x A251 . A556 x A624	66.8					109
Minn. 619	A427 x A556 . A239 x A251	69.2					
Mich. 60-47	MS1334 x W59M . 5-5 x 5-9	49.0	119.4	44.8	80.6	57.4	
Mich. 60-54	MS1334 x 5-9 . W59M x 5-5	48.5	118.5	50.6	75.7	51.5	
Wis. 253	H x J . 73A		115.5				
AES 101			83.9				
AES 204			109.0				
Minn. 805			118.1	67.5			95
NE 310				36.5			
NE 310				40.4			
Pa. 215				50.1			
Pa. 290				58.9			
N. Dak. 95	A556 x A 508 . B8 x W79A				87.5		
Cornell M4				55.9			

Table 22. Percent moisture at harvest for double-cross regional trials of 100-300 maturity in 1963.

		Percent moisture					
Hybrid	Pedigree	Mich.	Spooner	Penn.	N. Dakota	S. Dakota	Minn.
AES 202	W59M x CMD5 . MS1334 x A509	22.6					
Mich. 250	Oh.51 x R53 . W10 x MS206	25.7		24.2			
Mich. 270	MS1334 x B8 . W10 x MS206	24.2	24.8	23.1	28.3	28.0	
Mich. 300	MS1334 x MS211 . W10 x MS206	29.2		28.0			
N.D. 85	ND468 x ND363 . B8 x A90	23.9	20.5	21.9	25.9	27.7	22.7
N.D. 101	ND474 x ND203 . B8 x A90	22.4	20.8	23.6	25.4	25.1	22.5
N.D. 103	ND405 x ND363 . B8 x A90	25.3	21.5	22.1	28.8	29.3	22.8
N.D. 105	ND474 x ND407 x B8 x A90	21.5	20.3	22.1	25.7	27.5	22.2
Minn. 806	A509 x MS1334 . 182B x A544	21.1	22.7	22.1	22.1	23.3	18.2
Minn. 207	A509 x W59M . 182B x A544	22.5	20.5	23.9	22.1	20.6	20.2
Minn. 211	A575 x W59M . 182B x A544	24.0	21.3	20.9	24.8	24.3	20.7
Minn. 212	W33 x MS1334 . A554 x A575	23.5	22.4	21.2	25.5	23.9	19.9
Wis. 1691	W59E x W271K . W617	22.5	25.8	23.5	26.0		17.6
Wis. 1694	W59E x W613 x W73A	20.7	22.8	23.1	26.8		18.1
Wis. 1703	W59E x W609 . W73A	20.2	21.4	21.1	24.2		19.8
Wis. 260	W59E x W41A . W401 x W182B	20.1	18.8				
Wis. 269	W182B x W375B . W491 x W537	24.0					
Wis. 273	W59M x W117 . W182B x W182E	23.5	22.5				23.3
Wis. 346	W59M x W117 . W153R x W37A	25.6					
Wis. 335A	W153R x W37A . M13R x W182B	28.2					
Wis. 415	W64A x W182E . W153R x W37A	27.4					
Minn. 613	A239 x A251 . A556 x A624	28.4					26.4
Minn. 619	A427 x A556 . A239 x A251	27.2					
Mich. 60-47	MS1334 x W59M . 5-5 x 5-9	23.8	27.8	24.4	29.1	25.1	
Mich. 60-54	MS1334 x 5-9 . W59M x 5-5	24.1	26.9	24.8	29.6	28.3	
Wis. 253	H x J. 73A		20.0				
AES 101			18.9				
AES 204			23.5				
Minn. 805			20.2	22.3			19.5
NE 310				22.0			
NE 310				25.8			
Ia. 215				23.6			
Ia. 290				23.6			
N.D. 95	A556 x A508 . B8 x W79A				30.3		
Cornell M4				26.8			

Table 23. Agronomic data for double-cross regional tests of 100-300 maturity in 1963.

Hybrid	North Dakota Rating Plants 1-5	North Dakota Rating Ears 1-5	North Dakota Height Plants inches	North Dakota Height Ears inches	Mich. Lodging percent Stalk	Mich. Lodging percent Root	Penn. Percent Silked Aug. 3rd	Penn. Percent Broken Stalks	North Dakota Lodging stalks	North Dakota Lodging Root	Spooner Hybrid Rating	Minn. Lodging stalks
AES 202					1.4	0.0						
Mich. 250					1.3	0.0	28.4	2.7				
Mich. 270	16	1.8	84	42	2.7	0.0	57.8	3.7	0.5	2.0	V. good	
Mich. 300					0.0	0.7	19.4	4.2				
N.D. 85	2.2	2.6	80	33	0.0	0.0	69.3	7.0	4.5	5.0	Good	9
												14
N.D. 101	2.8	2.8	80	33	1.3	0.0	91.2	12.0	8.3	1.2	Good	10
N.D. 103	2.3	2.0	82	36	0.7	0.0	70.6	2.8	0.5	2.0	Good	10
N. D. 105	3.2	2.2	78	30	0.7	0.0	85.2	2.9	0.3	3.2	V. Good	16
Minn. 806	2.9	2.1	79	32	0.6	0.0	100.0	5.7	2.1	5.2	Good	11
Minn. 207	2.4	1.9	78	26	1.3	0.0	70.8	5.7	1.6	8.0	Good	13
Minn. 211	2.9	2.2	78	32	0.7	0.7	67.7	3.8	5.0	8.0	V. Good	
Minn. 212	2.0	2.8	82	36	1.3	0.0	47.4	4.1	5.2	6.0	V. Good	19
Wis. 1691	2.8	2.5	72	24	6.1	1.9	54.0	2.9	0.3	0.5	Fair	23
Wis. 1694	3.4	1.8	77	34	2.1	0.0	61.7	3.3	0.2	0.4	V. Good	17
Wis. 1705	2.8	1.9	79	36	1.3	0.7	74.4	6.7	0.3	2.5	V. Good	25
Wis. 260					2.0	0.0					Good	
Wis. 269					0.7	1.2						
Wis. 273					1.3	0.0					V. Good	13
Wis. 346					0.0	0.0						
Wis. 335A					0.0	0.0						
Wis. 415					1.3	3.5						
Minn. 613					1.2	0.0						9
Minn. 619					0.0	0.0						
Mich. 60-47	1.8	2.4	84	40	0.0	0.0	74.6	5.7	0.5	1.0	V. Good	
Mich. 60-54	2.0	2.1	84	41	1.4	0.0	69.6	12.6	0.3	0.0	V. Good	
Wis. 253											Good	
AES 101											Fair	
AES 204											Good	
Minn. 805							98.7	2.8			V. Good	1
I. 310							46.2	3.3				
NE 310							22.0	6.7				
Ia. 215							91.2	14.0				
Ia. 290							71.2	14.1				
N.D. 95	2.0	1.5	83	38					0.0	2.1		
Cornell M4							60.9	8.3				

Table 24. Average agronomic data for 17 three-way crosses of 100 maturity grown at Fargo, North Dakota in 1963.

Inbred 1/	Stalk Rot Rating 1-5	Root Lodging percent	Stalk Breakage percent	Days Silk	Ear Moisture Harvest	Bushel per acre	Rating 1-5 Plants	Ears
W-D	2.0	20	12.1	48	14.2	56.1	2.6	1.8
SD5	2.6	0	5.5	54	23.8	51.6	3.1	2.6
CO-131	4.3	33	19.4	51	13.7	46.1	4.0	2.8
ND203	1.9	12	8.3	53	15.5	58.2	2.6	2.1
ND364	1.8	16	0.5	53	15.5	57.1	2.5	2.2
ND363	2.7	1	6.2	54	15.5	61.2	2.4	2.0
ND468	3.8	2	5.0	54	18.4	61.4	1.8	2.0
ND474	4.2	24	5.5	54	17.5	61.8	2.4	1.8
A554	2.1	3	5.0	55	16.9	60.7	2.0	2.8
A498	3.0	21	12.1	54	19.1	61.7	2.2	1.6
W59E	2.9	3	0.5	53	19.0	56.3	2.5	2.1
SD8A	3.5	10	8.3	54	22.5	57.2	2.9	2.5
SD5A	3.4	12	0.4	54	22.8	56.8	3.0	2.4
SD48A	2.8	4	5.2	54	19.3	58.0	2.3	1.5
SD12	3.2	10	8.3	55	17.3	66.4	2.0	1.8
SD14	2.5	9	2.4	56	20.2	57.3	2.5	2.4
SDPI	3.1	21	0.3	55	20.7	67.9	2.6	2.0

1/ ND230 x SD48 used as the common tester parent.

Table 25. Average agronomic data recorded on 20 three-way crosses of 200 maturity grown at Fargo, North Dakota in 1963.

Inbred 1/	Stalk Rot Rating 1-5	Root Lodging Percent	Stalk Breakage Percent	Days Emerge Silk	Ear Moisture Harvest	Bus/Ac.	Rating 1-5 Plants	Rating 1-5 Ears
B8	2.0	0	5.0	55	28.0	71.6	1.2	1.3
MS24	2.7	0	0.5	55	27.5	62.3	2.4	2.2
MS142	1.5	0	0.5	56	28.8	68.0	1.3	1.9
A90	2.1	4	4.0	56	30.0	68.3	1.3	1.5
ND376	3.3	0	0.0	58	31.8	69.8	2.0	1.5
ND385	2.2	9	0.5	57	31.1	70.8	1.6	1.6
ND399	3.0	17	8.3	54	29.2	68.8	2.5	1.8
ND405	2.5	5	0.2	57	30.9	72.8	1.0	1.8
ND407	3.4	9	4.1	58	31.5	71.4	1.9	1.6
ND408	2.3	0	0.3	58	33.1	71.9	1.5	1.8
ND480	2.4	0	0.4	58	31.0	67.9	1.0	1.6
330	3.1	10	4.0	55	23.9	70.9	1.8	2.1
MS1334	2.4	9	2.1	56	28.7	67.5	2.5	2.4
W182B	2.1	0	2.4	58	21.7	67.5	2.4	1.6
SD20	2.9	0	2.6	55	26.7	63.2	1.9	2.3
SD9	3.1	9	0.0	54	29.4	64.2	2.1	1.8
SD10	1.9	5	8.3	56	20.9	68.3	1.9	2.2
SD15A	2.6	0	2.4	56	31.9	72.3	1.0	1.3
SD21A	3.4	0	0.4	58	32.4	68.0	1.9	1.6
SD21	1.8	0	0.3	57	34.6	74.0	1.6	1.3

1/ A498 x W79A used as the common tester parent.

Table 26. Average agronomic data recorded on 14 three-way crosses of 100-200 maturity grown at Pennsylvania and Wisconsin in 1963.

	Penn.				Spooner	
Pedigree	Moisture	Bus/ac	Percent Broken Stalks	Percent silk Aug. 3	Bus/ac	Moisture
ND230 x SD48 . ND363	20.6	40.4	4.9	90.9	104.6	17.8
ND230 x SD48 . ND364	21.6	50.8	8.8	42.7	88.0	20.2
ND230 x SD48 . ND463	23.3	59.2	2.3	61.6	100.6	17.3
ND230 x SD48 . ND474	24.0	47.3	14.4	75.2	98.0	19.5
A498 x W79A . MS142	27.7	71.1	13.8	62.8	118.6	27.2
. ND330	25.2	46.8	18.1	29.1	128.3	20.6
. ND376	27.1	54.1	5.9	47.5	115.8	27.3
. ND385	27.3	73.1	19.5	60.6	107.6	29.6
. ND399	27.6	50.2	63.2	78.9	123.4	17.3
. ND405	28.5	45.1	7.3	64.0	121.9	23.0
. ND407	27.2	51.4	10.5	54.9	117.4	28.6
. ND408	27.4	32.1	8.7	7.7	109.4	29.7
. ND480	26.7	58.8	6.7	31.5	129.3	26.9
. MS24A	27.8	48.4	11.9	85.7	121.5	23.6

After acceptance of the reports of the sub-committees on the maturity series Chairman Dollinger asked if there was additional business or comments to present to the committee. Dr. N. P. Neal raised the question of proper nomenclature of so-called single-cross hybrids. After some discussion it was agreed that the Committee would take no action at this time. Dr. W. I. Thomas informed the Committee that Pennsylvania had prepared two series of hybrids, one early and one late, which they would like to have grown on a regional basis. This set of hybrids involves high and low accumulators for six mineral elements. Dr. W. A. Russell recommended that the sub-committee on grouping of inbred lines be continued and report at 4 year intervals.

The Chairman then called for the report of the Nominating Committee. The Committee proposed the name of Dr. A. L. Hooker to serve as the new member of the Executive Committee. There being no nominations from the floor the Secretary was instructed to cast a unanimous ballot for Dr. Hooker.

Chairman Dollinger then thanked the Chairmen of the standing sub-committees for their support and cooperation during the year and the speakers for their willingness to contribute to the program. The meeting was adjourned at 10:45 a. m.

The Executive Committee convened immediately. J. C. Sentz was elected Chairman for 1965. Committee appointments were reviewed and the new standing committees are attached.

OFFICERS AND COMMITTEE MEMBERSHIP FOR 1964-1965

Administrative Advisor
N. J. Volk

Executive Committee

E. J. Dollinger	1961-1965
J. C. Sentz, Chairman	1962-1966
L. F. Bauman	1963-1967
A. L. Hooker	1964-1968

SUBCOMMITTEES FOR 1964-1965

Preservation of Germplasm
E. J. Dollinger, J. H. Lonnquist, D. B. Shank, Chairman

Grouping of Lines for Breeding Purposes
L. F. Bauman, N. P. Neal, W. A. Russell, Chairman

Meeting Place
D. B. Shank, M. S. Zuber, P. Crane, W. A. Russell, Chairman

Uniform Tests in the 900 Maturity Series
P. J. Loesch, M. S. Zuber, F. A. Loeffel, Chairman

Uniform Tests in the 700-800 Maturity Series
E. R. Leng, L. H. Penny, W. R. Findley, Chairman

Uniform Tests in the 400-500-600 Maturity Series
L. F. Bauman, E. C. Rossman, J. C. Sentz, Chairman

Uniform Tests in the 100-200-300 Maturity Series
E. H. Rinke, Wm. Wiidakas, A. M. Strommen, Chairman

Uniform Tests on Stability and Genotype-Environmental Response of Hybrid Types
E.R. Leng, E. C. Rossman, M. S. Zuber, S. A.Eberhart, Chairman

ROSTER OF ATTENDANCE

Canada		
Gamble, E. E.	Ontario Agric. College	Guelph
Giesbrecht, J. E.	Dept. of Agriculture	Morden
Illinois		
Dimler, R. J.	ARS-USDA	Peoria
Hooker, A. L.	University of Illinois	Urbana
Leng, E. R.	" "	"
Skmaroev, G. E.	" "	"
Indiana		
Bauman, L. F.	Purdue University	Lafayette
Crane, P. L.	" "	"
Ullstrup, A. J.	ARS-USDA	"
Iowa		
Eberhart, S. A.	ARS-USDA	Ames
Hallauer, A. R.	"	"
Leppik, E. E.	"	"
Penny, L. H.	"	"
Russell, W. A.	Iowa State University	"
Scott, G. E.	ARS-USDA	"
Skrdla, W. H.	"	"
Kansas		
Wassom, C. E.	Kansas State University	Manhattan
Kentucky		
Loeffel, F. A.	University of Kentucky	Lexington
Maryland		
Sprague, G. F.	ARS-USDA	Beltsville
Michigan		
Rossman, E. C.	Michigan State University	E. Lansing
Minnesota		
Sentz, J. C.	University of Minnesota	St. Paul
Missouri		
Ferguson, Virgil	ARS-USDA	Columbia
Helm, J. L.	University of Missouri	"
Loesch, P. J.	ARS-USDA	"
Zuber, M. S.	"	"

Nebraska		
Gardner, C. O.	University of Nebraska	Lincoln
North Dakota		
Wiidakas, Wm.	N. D. State University	Fargo
Ohio		
Dollinger, E. J.	Ohio Agr. Expt. Station	Wooster
Findley, Wm. R., Jr.	ARS-USDA	
Pennsylvania		
Thomas, W. I.	Penn State University	Univ. Park
South Dakota		
Beatty, D. W.	So. Dak. State College	Brookings
Fitzgerald, P. J.	ARS-USDA	"
Shank, D. B.	So. Dak. State College	"
Stoner, W. N.	ARS-USDA	"
Wisconsin		
Davis, J. R.	University of Wisconsin	Madison
Hoppe, P. E.	ARS-USDA	"
Nanda, D. K.	University of Wisconsin	"
Neal, N. P.	" "	"
Strommen, A. M.	" "	Spooner